

Henry Thwaites

A GENERAL
T R E A T I S E
O F

Husbandry and Gardening.

CONTAINING

Such Observations and Experiments
as are New and Useful for the Im-
provement of Land.

W I T H

An Account of such extraordinary In-
ventions, and natural Productions, as may
help the Ingenious in their Studies, and pro-
mote universal Learning.

V O L. I.

With Variety of curious CUTTS.

By RICHARD BRADLEY,
Fellow of the Royal Society.

L O N D O N:

Printed for T. WOODWARD, at the Half-Moon
against St. Dunstan's Church, Fleet-Street;
and J. PEELE, at Locke's Head in Pater-
Noster Row. M.DCC.XXIV.

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A GENERAL

TREISE



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A GENERAL
TREATISE
OF

Husbandry and Gardening,

For the Month of *April.*

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improve-
ment of Land.

WITH

An Account of such extraordinary In-
ventions, and natural Productions, as may
help the Ingenious in their Studies, and pro-
mote universal Learning.

*To be continued Monthly,
With Variety of curious CUTS.*

By R. BRADLEY,
Fellow of the ROYAL SOCIETY.

L O N D O N :

Printed for J. PEELE, at *Locke's Head*, in
Fater-noster Row. Price 1 s.

A GENERAL

TRIFLE



Philosophy and Gardening

For the Month of April

CONTAINING

Some Observations and Experiments as
to the Use of the Sun for the Improve-
ment of Land.

W. I. T. R.

The Author of each extraordinary in-
vention, and natural Productions, as may
be seen in the History of their Nature, and the
more universal Learning.

To be continued Monthly

With the History of the Year 1665

By R. BRADLEY

Printed at the Royal Society.

L O N D O N

Printed for J. PETER, at the Head in
the Temple Lane, 1665



TO
The Right Honourable the
Lord CARTERET,
One of His MAJESTY'S
Principal Secretaries of
State.

MY LORD,



THE favourable Reception which some of my former Works have met with, and the Encouragements I have had to pursue my Studies in the

useful Parts of Natural History, has prompted me to undertake the Task which I now venture to lay before your Lordship.

THE Improvement of Land, and the Study of Agriculture, have greatly contributed to render our Nation famous above all other Countries ; but whether that is owing more to the natural Industry of our People in general, or to the good Reasoning of particular Persons, is doubtful ; if it proceeds from the former, there is Room enough to hope for its Advancement by the latter ; or if this useful Art has made its Way thus far, by the Labours of Experimental Philosophers, 'tis Encouragement enough for them to continue those Studies, since we neither want People or Industry to bring their Designs into Practice.

BUT

Dedication.

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B U T as every Art, however extensive or useful, demands the Protection of the Great, to make it circulate in the Minds of the Publick ; so am I confident there is no surer Way of Recommending these Papers to the World, than by introducing them under the Patronage of your Lordship, whose extensive Genius, wise Conduct, and Love for his Country, is justly rewarded with the Favour of the Prince, and the good Will of the People.

I am,

May it please your LORDSHIP,

Your LORDSHIP's

Most Obedient,

Humble Servant,

R. Bradley.

BUT as every Art, however ex-
tensive or useful, demands the pro-
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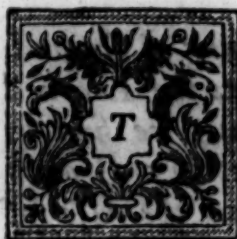
May it please your Lordship
I am, Sir, your Lordship's
Obedient Servant
R. Baskley

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THE PREFACE.



THE present Undertaking is design'd chiefly for the Improvement of Husbandry, by introducing among the Practitioners in that Art, a reasonable Way of thinking and judging of what they go about, when they attempt the laying up of fresh Grounds, or of fertilizing those which they suppose are already worn out.

It is indisputable that fresh Grounds are full of Riches, especially such as have long lain under a Turf, for the Roots of the Grass seldom draw their Nourishment deeper than two or three Inches ; so that such a Land, when it comes to be plough'd six

or

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or eight Inches deep, will yield good Corn, after it has been a little exposed to the Air, notwithstanding that Corn is of the grassy Tribe, and must therefore necessarily draw a Nourishment of the same Kind as that is which supports the Growth of common Grass; but when the Plough has turn'd up the Ground, we know that three Fourths of the Soil so turn'd up is fresh and new, and therefore must be profitable to the Grain sown upon it; and the Crop will be more or less prosperous, as we give that Soil the Sort of Seed, which is most natural to it.

The refreshing and fertilizing of Ground, by fresh or untry'd Earth, as the Learned Mr. Lawrence has taught us, we find by Experience benefits the Vegetation or Growth of Plants, much more than the Use of Horse-Dung, or such Kinds of Soil; and it carries this Advantage along with it, that where these Manures are scarce and chargeable to come at, we may have the Use of fresh Earth at an easy Rate, and reap a Crop to our Advantage, but especially if the Soil used for Manure be of a different Kind from that Land we lay it upon.

In the common Method of ordering of Ground, we suppose it well enrich'd if we lay

lay a tenth Part of Manure upon the Land, i. e. that the Land plough'd up is nine Parts to one of Manure; but this is trifling, with regard to the Richness we gain by turning up fresh Ground under the Turf, wherein we may say there is three Parts in four of Manure, which is much more natural than Dung.

The Farmers in Devonshire are so sensible of the improving one Soil by Means of another, that they never pull down any House, whose Walls are made of Cobb, which is a Mixture of Loam and Straw, but they always carry it carefully to their Corn Lands, and find it very advantageous.

When Ground is thus made ready for the Grain or Seed, we are not only to consider the Nature of the Soil, but the Depth of it; for should the Soil be fit for Carrots, Parsnips, or other long-rooted Herbs, if it has not a good Depth, at least fourteen Inches, the Roots will be haulk'd in their Progress downwards, and not yield the Profit we expect; these Roots, as well as Turneps, however, where they can be sown, relieve the Ground for other Crops, because they have not only a different Way of drawing their Nourishment, than either the Grasses, or Bean or Pea Kinds, but

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feed as differently from Grasses or other Herbs, as Horses do from Dogs, or Dogs from Fish.

In Berkshire we find another Sort of Ground, which the Farmers call fresh Land, and that is such as has had Timber and Under-wood growing upon it: They call this fresh Ground, because it has not been employ'd in the Memory of Man to produce such Crops as are cultivated with the Plough; the Produce is always extraordinary in such Places, either from the Richness the Land gathers from the vegetable Salts it acquires from the continu'd Fall of the Leaves, broken Twigs, decay'd Chips, &c. or else perhaps because those Particles, which are nourishable to Grasses or the Corn Race, have been undisturbed, while the Trees were growing upon it; for certainly, Trees draw a very different Kind of Nourishment from the Earth, than what is necessary to feed the lower Kinds of Vegetables.

From this Way of Reasoning I suppose some of the most ingenious Husbandmen have contriv'd to shift their Crops from Year to Year to ease the Ground; but I find few of them to carry their Judgment so far as to follow one Crop with another of so different a Kind, as to draw quite different

The P R E F A C E. xi

different Juices than the first, or to follow the second with a third differing from both. I am perswaded, was this rightly consider'd, there would be no need of laying Ground fallow for two or three Years, as the Farmers do in some Countries, to give it Rest as they call it.

We have, indeed, some Examples which seem to declare the Wisdom of the Farmer, and shew his Reasoning; such as the sowing Clover with Barley, and Clover with the Grass, which in Devonshire is call'd Ever, or Everlasting-Grass, which is nearly the same with the Rye Grass in Middlesex; so in some Parts of Northamptonshire they have learn'd the Art of Cinquefeul or five-leav'd Grass, as they call it, which they sow with other Crops; but tho' the Clover and the Cinquefoil are both term'd Grasses by the Country People, it is apparent enough to Men of Judgment that they have no Relation to that Tribe, but differ as much in the Structure of their several Parts from Grass or Corn, as Grass does from a Strawberry or Violet Plant: So that the Reason why they thrive, being sown among Grasses, is, because they draw a different Nourishment from the Ground. I have known three good Crops of Clover cut off of one Piece of Ground, the second Year after sowing, tho' the Year it was sown

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sown yielded as good a Crop of Barley upon the same Spot, as could well stand upon the Ground.

In a Word, I shall endeavour in the following Papers, as much as possible, to promote the Art of Husbandry, preserving a due Regard, as well to the practical as the philosophical Part of it, that so we may improve our Reason by Practice, and be able to support our Practice by Reason, which I account the surest Way of bringing Agriculture to such Perfection as may redound to the enriching of the Landlord, the Ease and Welfare of the Tenant, and prove of general Advantage to the whole Kingdom.





A GENERAL
TREATISE
OF
Husbandry and Gardening.



THE Design of this Work is to enquire into the Nature of such Lands as are most capable of Improvement, and to propose the most proper Method for fertilizing them. For altho' our *English* Husbandmen are allow'd by all Nations to have a superior Genius in Agriculture, preferable to those in other Countries, yet it is rare to find one of them who ever attempts any new Discovery, or even can give any other Reason

son for what they do, than that their Fathers did the same before them.

This brings to my Mind the Observation of a very ingenious Man, who had maturely consider'd this Case: He observes, that the Country People generally pick out such of their Children to employ in Husbandry, as they judge are not worthy of good Education; and whom they suppose have so little Genius, that they are only fit to drudge in hard Labour: And 'tis likewise for the same Reason, says he, that we find so few good Gardeners among the Crowd of those who pretend to these Arts. Husbandry and Gardening ought rather to fall under the Care of expert Philosophers, and reasonable Men, who have Judgment enough to remark the different Effects of different Seasons; the Situation of the Lands they are to cultivate; the Depth and Quality of their Soils; the easiest Ways of mending Land, by mixing one Soil with another; or how to appoint to each natural Earth its proper Plant; and not as some do, be too positively confirm'd by Custom to make new Experiments, which might, with small Trouble and Expence, be done in By Places, and might tend to their own and the Publick Good.

'Tis partly for these Reasons, we observe so many large Tracts of Ground lying now in a Manner waste and unprofitable: And as I have no greater Pleasure than in making my Observations and Remarks in this Way of Knowledge, I judge that what may be transmitted from Time to Time to the Publick, on this Head, will be acceptable and beneficial.

In



In this Undertaking, I shall likewise describe the several curious Contrivances for draining of Lands, and forcing or raising of Water; and also for meliorating and refining it, when we are possess'd of a sufficient Quantity of it. This I suppose may prove useful in many Places, and be of no small Advantage to the ingenious Authors and Makers of such Inventions, whose Names I shall mention with Honour, as I have Opportunity of knowing them.

The Correspondence I have already fix'd, and what I still expect from some of the first Class in this Way of Study, will sufficiently (with my own Remarks) furnish out such a Work as I now design, and contribute to the general Improvement of Lands; which will be like a new Acquisition of Territory to our Nation, and perhaps be one Means of restoring our Credit, and prove of Advantage to the Poor, by employing them in profitable and healthful Exercise.

Our Parliaments have already began to enclose Commons; and I doubt not but most of the Commons in *England* might be brought into the same regular and happy State, provided the Poor (who have generally the Right of Commoning) have severally their Parcels of Land determin'd by Balloting, or any other Way, where Bribery or particular Interests cannot take Place. The Forrests likewise might turn to a good Account, were the Lands parcell'd out, and every Tenant oblig'd to plant certain Quantities of Timber for publick Advantage: This, in my Opinion, would be a sure Means of supplying the Nation

with that valuable Commodity, which at present is so scarce, that its Price is above one third Part more than what the same Measure was sold for Twenty Years ago, as appears by several Accounts of that Date, compared with those of this present Year 1721.

But whoever takes a Survey of the Forrests, will find sufficient Reason to support what I say, without having Recourse to such Accounts: They will find not only a Want of Timber in those Places, but even the Prospect of a Supply for the future cut off by idle People living in their Neighbourhood; who, rather than be at the Expence of a little Firewood, or some trifling Tool or Utensil, will destroy young thriving Plants of Oak, which perhaps had already gain'd Twenty or Thirty Years of Time, and were in a prosperous State; and this we find is still practis'd, notwithstanding the many Acts of Parliament, made in several Reigns, to prevent this Destruction of Timber-Trees.

But 'tis with no small Pleasure, I observe some Noblemen and Gentlemen begin to enter into the Reasonableness of making Plantations of Timber, and preserving and weeding such Woods as their Ancestors were wise enough to erect. The Plantation and Care of Timber is like buying the Reversion of an Estate; for a little Money expended, we become Heirs to great Sums.

This Case therefore, which carries so much Advantage with it, I shall propagate as much as possible in this Work; having several Observations and Letters now by me of Importance, which relate to the Subject; wherein
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there are not only many Discoveries tending to the Improvement of Woods and Timber-Plantations, but several Valuations from the Measure of Timber Trees, taken at different Times, whereby we may compute the Increase of Worth in such Trees from One to Twenty Years: And I cannot avoid soliciting every Gentleman, who has kept such a Register, to communicate what has been observ'd in that Way, with some Account of the Soil, Situation, and Time of Planting, if possible; that from many Instances we may come near a Certainty of the Growth and Value of Timber, and give the Publick a View of how much every Acre of Wood-Plantation may grow in a Day, a Week, a Month, or a Year, having due Regard at the same Time to the Sorts which are growing, according to their Proportion of Difference; not unlike what I have heard, that Herbs grow in Pence, and Shrubs in Shillings, while Timber grows in Pounds; but this I shall explain more fully in another Place.

As for Gardens, I shall mention them with the rest, as Occasion shall afford me sufficient Variety of Observations to improve them in their several Orders; and remark how far the Skill of the Workmen employ'd in them, makes them excel the Neighbouring Gardens: And, for the better Information of my Reader, shall give such Remarks upon the Weather, and the Produce of every Month, as may be serviceable and worthy the Notice of all such as are either Husbandmen or Gardeners: For one of the surest Methods to be taken for understanding Agriculture and Gardening, is to enquire in-
to

to the Course of Seasons, and their Consequences. In a Word, I shall make it my Business to publish such Things in this Work, as may improve our Lands, or be otherwise advantageous to the Publick.

The first Case I shall mention relates to the Purchase of an Estate, chiefly consisting of Heath-Ground, for the most part Mountainous or Hilly, in a Letter directed to me.

To Mr. R. BRADLEY, &c.

S I R,

I Am now about purchasing Five or Six Hundred Acres of Land, in *Surrey*, which the Neighbouring People tell me has born nothing but Heath in the Memory of Man; this Land joins to the Town where I was born, and it may be my natural liking to the Country where I first drew my Breath, and receiv'd some little Diversions in my Childhood, might give me Occasion to think of treating for this Piece of Ground; but I must confess I am now more desirous to possess it, since Mr. ——— tells me you think 'tis capable of Improvement. You will oblige me if you will give your Thoughts of it as soon as possible, and am

Yours, &c.

R. S.

P. S. I send you by the Bearer a Design of the Whole, and a few Specimens of Earths, as they lie in their Beds; Number I is the Surface; II the next; and so on.

Ac-

Account of the Earths.

- ‘ N^o. I A black sandy Soil, which for 4
‘ Inches is mix’d with Roots of Heath;
‘ the same Bed of Soil, (but without
‘ Roots) is 16 Inches deep on the Hills;
‘ and in the Lower Lands about two
‘ Foot. In this we frequently find Stones
‘ resembling rusty Iron.
- ‘ N^o. II, or 2d Stratum, is white Sand,
‘ Three Foot thick on the Hills, and is
‘ the same in Quality and Thickness in
‘ the Vale or Low Ground.
- ‘ N^o. III, or 3d Stratum, a Vein of Gra-
‘ velly Soil, 6 Inches deep on the Hills—
‘ but in the Vale, a grey Sand Fourteen
‘ Inches deep.
- ‘ N^o. IV, or 4th Stratum, a grey Sand,
‘ Two Foot deep on the Hills, some-
‘ what wet and springy; but in the Vale
‘ Two Foot 4 Inches *Marle*.

Since I receiv’d this Letter, I had an Op-
portunity of viewing the Land; but as the
Gentleman was not then in the Country, I
sent him my Opinion in the following Epistle.

To Mr. R. S. Esq.

SIR,

I Have carefully consider’d the Ground you
are about to purchase, which the Country
People believe cannot be made profitable by
any means: For my own Part, was I to make
a Purchase of Land, I would much rather
chuse it of this Sort, than buy an Estate which
has

has been already improv'd and strain'd to an high Rent; tho' it is very certain there must be some Money laid out upon such Land as this, before it can become profitable, but that may be done by Degrees; and a Man has the Satisfaction at the same Time to set an Example to his Neighbours, which may become a publick Benefit.

But, before I enter upon the Nature of the Soil, and Method of improving it, it is necessary I give you some Hints concerning the Measuring of such Lands as are hilly or mountainous; for their valuable Contents, whether we plant, sow, or build upon them, are very different from what are found in flat or plain Ground; and to convince you of this, I shall give you some few Examples.

Ex. I. A Hill (I suppose) may contain 4 equal Sides, which meet in a Point at the Top; but the Contents of those Four Sides can produce no more, either of Grain or Trees, than the plain Ground upon which the Hill stands, or has its Base; and yet by the Measure of the Sides, we find twice the Number of Acres, Roods, and Poles, which measures in the Base or Ground Plat.

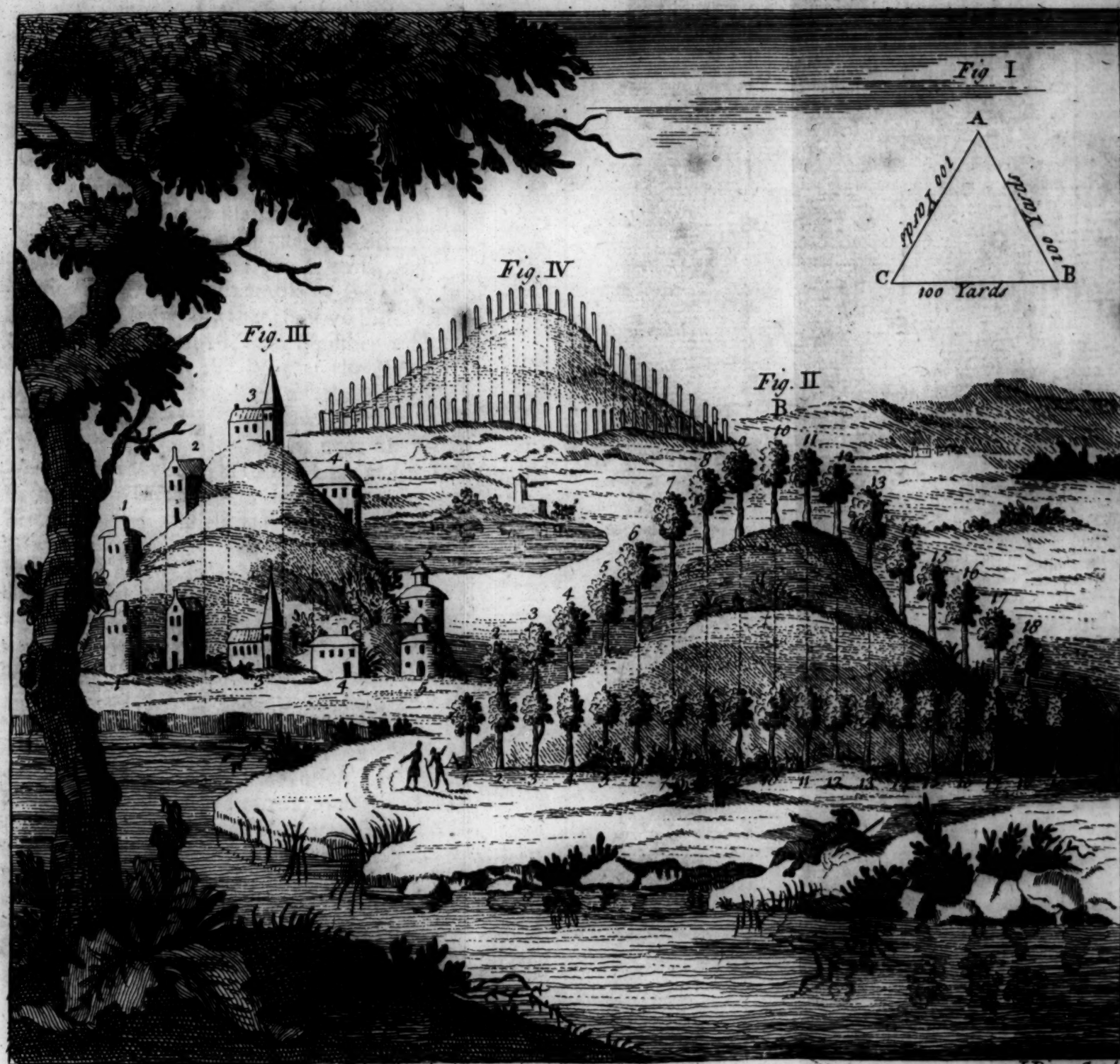
Fig. I is an equilateral Triangle, or a Body of three equal Sides: From A to B is One Hundred Yards; from A to C, One Hundred Yards; and from C to B, One Hundred Yards; so that from B by A to C measures twice as much as from C to B, and therefore it is commonly supposed will produce double the Quantity of Grain than the Line C B: But as long as all Plants preserve their upright Method of Growth, we may be assured such

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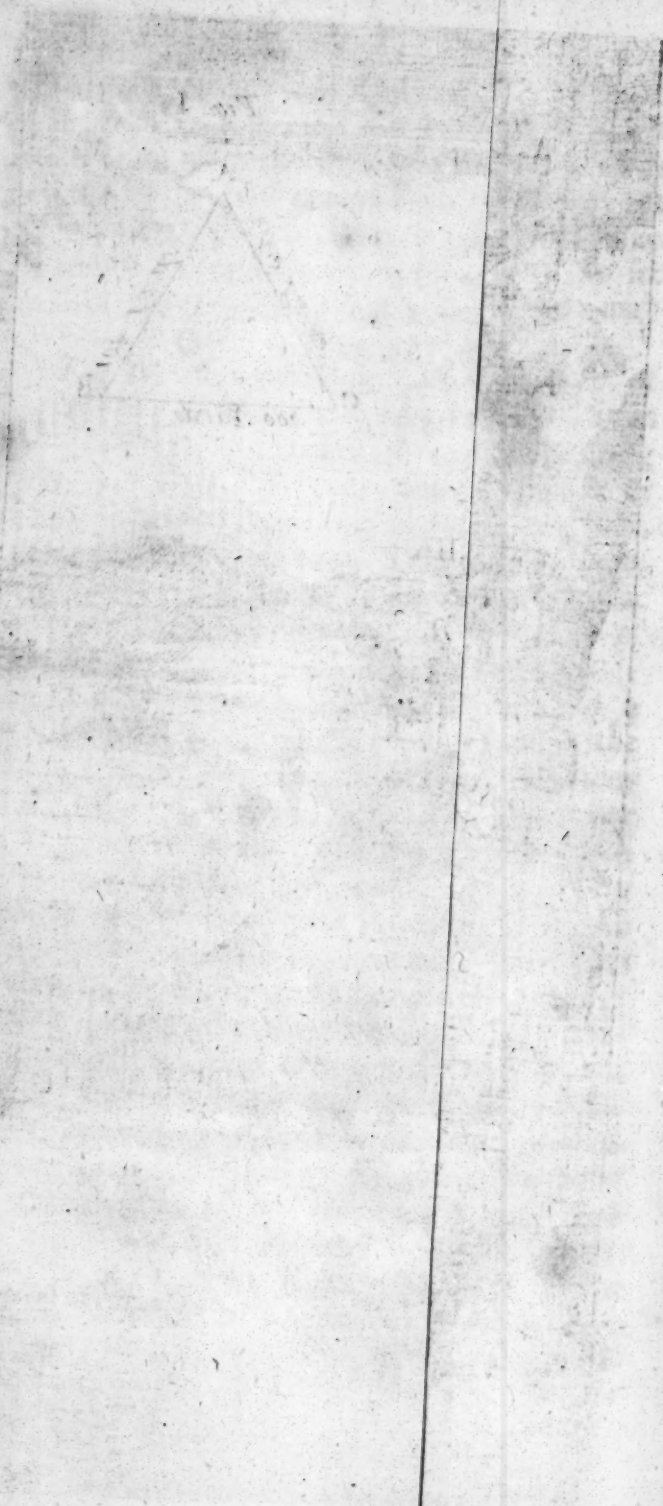
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J. Pine Sculp.



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such hilly Ground can bear no more Plants in Number than the Plain at the Base, as we may see in Fig. II, which represents a Hill, with a Row of Trees planted the Length of the Base, at certain Distances from A to C. In the same Figure we may observe the same Number of Trees planted from A by B to C, altho' the Line over the Hill measures almost double the Line from A to C.

Fig. III gives an Example of Buildings upon a Hill; shewing, that the two Sides of the Hill will only bear the same Number of Houses that may stand in the Line at the Base.

Fig. IV is an Example of Rails, or Park-paling, over a Hill; whereby we may discover that tho' the Measure be near double by the Way over the Hill to the Line at the Bottom, yet the same Number of Pales, of the same Breadth, and at the same Distance, serves to enclose both.

I could yet give many more Examples to prove that Hills, tho' they measure twice as much as the plain Ground they stand upon, yet the Produce of One can be no more than the Other; and therefore, in the Purchasing of Land the Hills ought not to be Sold or Let for more than Half their superficial Measure, *i. e.* two Acres upon the Side of the Hills to pay as much as one Acre upon the Plain, provided the Soil of both is equally rich, as it seems in this Case; tho' generally the hilly Ground is thought to be more enclining to Barrenness than the lower Grounds.

But it remains that I say something concerning the perpendicular Growth of the Stems of Trees, and other Plants, as it is

necessary to clear some Doubts which may arise from the foregoing Observations, among those especially who are not very well acquainted with the Manner of vegetative Growth.

The Point of the Stem, or Leader of every Trunk of a Tree, seeks the Air; and therefore, in Woods where the Trees are thick set, the whole Expence of Sap follows that upright Will of Nature; and the Trees in such a Station grow much taller and upright, than where one single Tree can have Benefit of making collateral Branches.

It is necessary that every Tree should grow upright or perpendicular to the Horizon, for the more easy Support of it self; for were Trees to incline naturally more to one Point than another, the Winds would more readily over-set them; or where Trees were fully furnish'd in the Crown or Head with collateral Branches, their Weight would contribute by Degrees to draw the Roots on one Side out of the Ground; but especially when such Branches are loaded with Fruit, we frequently find the Necessity of Propping them, as may be observ'd in many Orchards. We may indeed remark, that almost every Stem and every Root are form'd in a bending Manner under Ground, and yet all these Stems become strait and upright when they get above Ground, and meet the Air; and most Roots run as directly downward, and shun the Air as much as possible.

As Proofs of this Intent in Nature, for the upright Growth of Plants, we may observe that some, which make their first Shoots horizontally

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zontally from a Wall, or the Side of a sharp Bank, turn up their Points or extreme Branches to the Air, as soon as they have taken fast Hold with their Roots. The Marricaria, Parietaria, and Antirrhinum, are so many Examples. At first, indeed, when their Stems are tender, their own Weight bends them towards the Earth; but, in Time, as they become stronger, altho' the Weight of the Heads of those Plants is then much greater; they turn their Shoots upwards, and at length grow upright almost parallel with the Wall.

We may further remark how much this Intent of Nature is evidenced in the Growth of Pease, Cucumbers, and such like Plants; as soon as they meet the Air they grow erect, till they attain the Height of six or eight Inches; and then wanting Strength to support their upright Intentions, recline, and by gentle Degrees reach the Ground: But Nature in this Case gives them Means of Support, and to continue their perpendicular Vegetation, by Claspers or Tendrils; and if they have the Opportunity of catching hold of any Tree or Pole near them, they would still proceed in the first Rules of natural Growth. But it is not worth while to give this Assistance to every Pea we set; we have Experiments enough in every Field, of their innate Design of pointing their Branches upwards, when they have rested themselves upon the Earth, sufficiently to support this second Attempt.

The Cucumber I find brings much fairer Fruit, if it has the Advantage of climbing; and this Plant is not unworthy such Help, for

if it is treated in that Manner, 'tis grateful enough to reward our Care with a valuable Crop.

There is yet one more Observation which I think may be necessary to support my Argument; and is what I find constant in all Trees that have suffer'd by rude Winds, or have been blown down. Monsieur *Dodart*, of the Royal Academy of Sciences at *Paris*, tells us, that one Day, coming from *Mendon*, the Dauphin's Palace, thro' the Park, to *Chaville*, he observ'd on the Declension of the Hill several young Pine Trees, which had been blown down by Storms at different Places; he remark'd that tho' the Fall of those Trees were very different with Regard to the Declension of the Hill, yet the extreme Branches (which had been the Leaders of the Stems when the Trees were growing) retook their natural perpendicular Growth, and turn'd upwards, in such a Manner as to form sharp Angles, which open'd more or less, as the fallen Stems on the several Declensions of the Hill directed them to be upright: And he observes likewise that even the collateral Branches of Trees partake so far of the first Design of the Mother Stem, that whenever they are incommoded in their first Design of Growth, they tend upwards; but this last Observation of Monsieur *Dodart's* I have not remark'd,

You will pardon me, good Sir, for troubling you with a Letter of this Length; but as I find your Mind is bent upon a Purchase of such Lands as are for the most part Mountainous, I thought it my Duty to give you such Hints as might remind you of the necessary

nessary Precautions to be taken before you came to the full Agreement, viz.

That Hills, in their Measure, contain only as much profitable Land as the Plan or Plat of Ground they stand upon; and as a Proof of that,

All Vegetables or Plants have an erect Method of Growth. In my next, I shall direct you the best I can, how to improve the Land.

I am, S I R, Yours,

R. BRADLEY.

To Mr. R. S. concerning the Improvement of Heath-Ground, upon the foot of his Observations of the several Strata or Beds of Earth.

S I R,

'TIS with great Pleasure I sit down to answer the second Part of your Letter, which relates to the Improvement of Heath-Land; the Remarks you have made on the several Beds of Earth, and the Specimens you sent me of them, has given me some Thoughts, which, I hope, may be of Service to you in Husbandry.

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In the first place, it is necessary to make the proper Distinctions between the Hill and the Low Grounds; for the Vale has not only the Advantage in Measure, which I have already mention'd in the foregoing Letter, but has also the Benefit of Shelter, by Means of the Hills about it. A noble Lord lately told me, that when the Frost had destroy'd all the forward Beans and Pease on the Plains and Hills, that in a Valley in *Sussex* they remained unhurt: But this might happen as well by means of the Sea-Air, which prevents the Ravage of Frosts, as the Hills sheltering them from cutting Winds. In *Dorsetshire*, *Devonshire*, and other Places near the Sea, I have often remark'd, how much Plants were benefited by the Influence of the Vapour arising from the neighbouring Sea; but chiefly those which were of the lower Race, which are properly call'd Herbs. In these Parts I observe, that where the Hills shelter such Herbs from the North and East Winds, those Herbs come much more forward than where they have only the Advantage of Sea-Air.

But we may remark moreover, that the Vallies, even in the Inland Counties, are not so much over-ruled by Frosts, as the Hills. I remember about Two Years ago, as I was travelling to *Oxford* in *December*, I found a severe Frost and Snow upon *Stoken Church Hill*, but in the Bottom there was very little Sign of hard Weather; and about the City of *Oxford* the Ground was so open, that some People were then removing Trees. I could produce many more Instances of the like Nature,

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ture, would they not take up too much room in this Place; however, you may be certain of this, that all Plants which are of the Under Race, and are usually sown or planted in the Winter, are much more safe from Injury of Weather in the Vallies and Low Grounds than on the Hills.

The *Appenine* Hills, which seem to rival the *Alps* in their Height, are not without their valuable Produce; even on their North Side, they bring a sort of Wheat and Rye, which the People thereabouts sow in *March*, and affords them plentiful Crops: But I suppose these kinds of Grain would not stand the Winter in that cold Situation. However, that we may try what can be done in *England* with this Corn, I have communicated some of each sort to several curious Gentlemen in the most hilly Countries in *England* to make Trials with, but have not yet heard what Success they have had: However, I am of Opinion, they will not be disappointed; especially, because the Farmers about this side of the *Appenines* have very little Opportunity of assisting their Ground with Dung, or indeed any other Manure, unless by mixing one Soil with another.

The curious Mr. *Laurence*, to whom we have been oblig'd for some very instructive Pieces relating to Gardening, has put us upon the Use of untry'd Earth, to help such Lands as have been worn out. And upon the foot of his excellent Experiments in that Way, I have chosen to mix the light Soils with the stiff ones; supposing, that the sandy Soils will open the
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Parts of the stronger Lands, and that Clays or such as are close, and the Country Farmers call fat Land, will help to nourish and enrich the Sand, which of it self is too light to hold sufficient Moisture for the Support of Vegetation, or the Growth of Plants. In the Land you have chosen, you have fortunately a Bed of Marle to enrich the Sands, either on your Hills or Low Grounds. But this need only be used in case you design to proceed in the common Way, to turn up your Land for Corn, or such like: for even the Ground, which is now Heath on the Hills, may be render'd advantageous, by burning and ploughing it a sufficient Depth, and adapting those Plants to it which Nature at first design'd for sandy Land. For 'tis certain, there is not in Nature any kind of Soil, which has not its proper Plant to grow in it, as appointed by the first great Author of all Things.

The Plants which I find will prosper upon Sand of this kind, (*i. e.*) the Black sort, which is your upper Stratum, are Firs, Pines and Pinasters of all sorts; but the white Sand underneath to be mixed with it, will be of good use for Ash and Hazle, which yet will thrive much better if they are sown upon the Spot than to be transplanted; for whatever is removed from or to such light Land as yours is, must be constantly water'd to keep them alive, and the Expence will be more than they will be worth in many Years; besides, a fresh Plantation of such Trees as would be necessary for you to put into a Wood, would run away with a good Sum for Props or Stakes
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to support them, and after all, a seedling Nursery would be certain, and keep it self, without Hazard, and in gradual Time reward your Patience with sure Profit; but a more particular Direction for the forming such a Plantation, I shall give on some other Occasion. In the mean Time, I cannot help recommending, even on the Sides of such Hills, the sowing of the smallest, or as some call 'em, the shortest dwarf Pease, which may be put in the Ground the Beginning of *April*, and when they happen to lie expos'd to the South Sun I have known 'em bring good Plenty of Fruit; but they are at present so scarce that I do not know any Seedsman that has them to dispose of in great Quantities but Mr. *Watts* at *Kensington*. I rather chuse this Pea than any other, because it takes up very little Room, and yet will bring as many Pods as the larger Kinds; and besides it agrees with this light Soil, requiring much less Nourishment than the other Kinds, which run too much into *Haulm*.

When this Crop comes off, the same Ground, without Amendment, will bring excellent Turneps, much sweeter than those which grow in a heavier Land.

Liquorish is likewise a very profitable Crop in Ground of this sandy Nature; but in the lower Grounds Hops will turn to extraordinary Advantage, if they are well manag'd, as they are about *Farnham*, where the Soil is of a black sandy Kind; but in Time I shall send you a particular Account of the Methods us'd in the Hop Grounds both in *Hampshire* and *Kent*, which are the most famous

Countries in the World for the Production of that valuable Commodity.

Till I have an Opportunity of being more particular on these Heads, I shall only add, that in such a Soil as we find in your lower Grounds, I have seen Oaks, Elms, Walnuts, and Firr-Trees, grow very vigorously, which may serve to direct you in the Culture of those Grounds you design for Wood.

I am, SIR,

Yours, &c.

R. B.

In the foregoing Letters we may remark in general what is necessary to be observ'd by those, who would either purchase or improve Heath Ground, of which Sort we have a very large Quantity now in *England*, which turns to little or no Profit; I shall therefore, in the succeeding Sheets, give my Readers some particular Examples of the Success which some ingenious Gentlemen have met in several Attempts they have made to improve this Sort of Land; that as much as possible every Thing mention'd in these Papers, may be confirm'd by Example.

I might have added how advantageous it would be, in Ground of this Nature, to set apart some of the Mountainous for a Warren, altho' some Men might object that the Rabbets would destroy the tender, or even the grown Crops in the lower Ground; but I am well assur'd that where those Animals
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can meet with such juicy and succulent Herbs, as are frequent enough in low Grounds, they will rather do the Office of Weeders, than Destroyers; but should they happen to feed sometimes upon the sown Crops, the Damage done by them would be recompenc'd more than ten Fold, as I shall endeavour to prove from some Warren Accounts, which I design to publish in another Part of this Work. In the mean while we may be assur'd, sandy Hills, which lie dry without Springs, afford us the best tasted Rabbits, free from Distempers; and an Acre of such Ground will maintain and yield us more in Number, annually, than near double the Quantity of low Ground, where Rabbits are for the most Part over-fed, gain unwholesome rank Flesh, and are subject to be destroy'd by the *Rot*: For 'tis with these Creatures as with Sheep, such as have the Opportunity of feeding in rich Pasture, and grow large and fat, are never so sweet in their Flesh as the smallest Sort, which feed upon Downs where the *Bite* is short: Some, indeed, tell us that the agreeable Flavour of the Down Mutton is owing to the wild Thyme, which those Creatures eat in great Quantity on those high Lands; but I am of Opinion this is a Mistake, for I have often offer'd that Herb to Sheep, and they as constantly refus'd it.

I remember once, observing to a Farmer about *Salisbury* Plain, how much the Ground there might be improv'd by Tillage and Plantations, he told me very gravely, that as long as the Ground would bear Sheep, it yielded its full Value; and that the Change

I would promote would be expensive and precarious; besides, says he, we have now immediate Profit either for *Wool*, *Lambs*, or full grown *Sheep*, which brings us ready Money every Day; and, as he observ'd, employ'd the Poor of several Countries thereabouts. This, without doubt, must be allowed; but it is apparent from many Instances that Part of the Land there might yet be improv'd, as I endeavour to direct; for whatever Parts were lay'd up for Corn, might yield that Crop, and yet furnish some Proven-der for the Sheep, in the Winter, to save Hay, such as Turneps, &c. and an Acre then would be equal to the Expence of as much Hay as would grow upon four Acres; but I find lately some Gentlemen about *Salisbury* have come into my Method, they have began to turn up Land for Corn, Pease, Turneps, and such like, and have disposed some Grounds for Timber and Fireing, both which are much wanted about that City; but the latter especially is so scarce, that some of the Inhabitants have told me, their Coals and Wood, for Fireing, were brought from Places Eight and Twelve Miles distant; but I shall have Opportunities of noting many remarkable Particulars relating to the Improvement of the Lands in this County, at some other Time, when I treat of chalky Grounds, and the feeding of Sheep, the Papers for this Month being chiefly design'd as an introductory Discourse to the following Monthly Observations. But there may arise some Doubts concerning what I have said before of hilly Ground, where I have made it to yield only

ly one half Part as much Profit, with Regard to Vegetables and Buildings, as the plain Land; but in the Case of stocking a Hill with Rabbets it is otherwise, they have chiefly their Abode under Ground, and, according to the Depth and Variety of Turnings they possess, may inhabit perhaps the Space of Three or Four Surfaces, which besides their prolifick Quality, bring suddain Profit: Indeed we must suppose, that the more Rabbets are in a Warren, so much the more Food they require; but then we find that they only prey upon such common Weeds as one would chuse to destroy in other Cases, if they are left to their Choice; and 'tis likewise observable, that when they have hilly Ground to make their Beds or Burrows in, they rarely spoil the low Lands or Plains.

If this be allow'd, I am next to observe that the Profit arising from every Acre on the Sides of the Hill, by this Means, will amount to more than it would do if Plants could grow there obliquely like the Thorns or Spines on the Body of an Hedgehog; but I think I have already prov'd that Plants must grow upright.

While I am upon this Head I shall take Notice of something extraordinary relating to a Warren, as it was contriv'd and practis'd by the late Lady *Bellasis* at *Kensington*; her Ladyship, among many other Curiosities which were cultivated in her Gardens, and Volaries, dispos'd one Part for the breeding and feeding of Rabbets, in such a Manner, as that, by a constant Supply of nourishing Food, she might draw at any Time of the Year a sufficient

sufficient Quantity to oblige her Friends, and serve her Table ; but to prevent the unfavoury Taste which generally attends the Flesh of tame Rabbits, consulted as much as possible the Nature of the wild Sort, how much the open Air was beneficial to them, for this End she wall'd in a large square Place, and paved it at the Bottom, but in some Parts had large Heaps of Earth, ram'd hard, and turf'd, for them to burrow in ; but this, which was her first Attempt, fail'd, by frequently falling in upon the Rabbits : This however gave her no Discouragement ; she had a Terrass built with Arches, and fill'd with Earth, leaving proper Places for the Rabbits to go in and out ; but still there were many Inconveniencies, as the falling in of the Earth, and the Males destroying the young ones, besides the Difficulty of taking them when they were wanted ; but at Length concluded to build distinct Cells for every Female, so order'd that they might hide themselves at Pleasure, or take the Liberty of the enclos'd Ground when they thought fit ; these Cells were cover'd with Boards, lying Penthouse-wise, made to open at Discretion, for the better catching the Rabbits, and prevent the destroying of the Does that had young ones : Over the Entrance of every Cell was a Trap-Door, either for keeping them in or out ; at the South End was a cover'd Place where a Couple of Buck Rabbits were chain'd for the Service of the Does, and, according to the Warreners Rule, were enough for Twenty Five Couple of Females : In this Place was their Food, which was chiefly the Refuse of the Garden, with

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with some Bran and Oats, and large Blocks of Chalk Stone, which they frequently eat to prevent the Rot.

The Pavement or Floor was lay'd slope-wise for the better carrying off the Water, and Conveniency of cleaning, which was done very often, and contributed greatly to the good Thriving of the Rabbits.

In this Work I shall likewise have Occasion to mention the Use and Improvement of Poultry, and some Sorts of Cattle, about a Farm; for it is not only the making of Plantations, or the tilling or sowing of Land with proper Crops of Plants, or Grain, which enriches an Estate, there is great Profit to be reap'd by grazing and feeding Cattle and Poultry; and without they are rightly understood, a Farmer may lose a great Part of those Benefits which the judicious Husbandmen enjoy. Nor indeed is the Knowledge of Pond-Fish, and the Method of improving them, to be neglected: They carry their Value with them, even tho' such Ponds lie near the Sea; I have often heard Gentlemen regret the Want of such Conveniences.

In some Places I know it has been thought impossible ever to stock their Ponds with Carp, Pike, Tench, or such like, because there were not any of those Fish near enough to be brought alive to the Places desir'd; but there is no Difficulty in such Case, if we can but get a good Quantity of the Spawn of those Fish, they may be transported for several Days Journey in Barrels of Water, and stock our Ponds if the Spawn has a due Quantity

tity of Air while it is in the Barrels: I remember an Instance of it, where a Gentleman of my Acquaintance had long desir'd to store his Pond with Tench, he try'd in vain to bring them a Day's Journey alive; but at length he was advis'd to provide a large Quantity of Spawn of those Fish, and send it into the Country thus barrell'd up, which he did much to his Satisfaction; for, in a short Time, he had so great a Quantity hatch'd in his Ponds, that he was capable of supplying all his Neighbours; besides, there is this Advantage in storing Ponds by Spawn, that the Fish become natural to the Water, and thrive in it much more than if they had been accustomed to a Water of another Sort.

I have also known that some Gentlemen have had Curiosity enough to transport the Eggs of extraordinary Land and Water Fowl some Hundred Miles, and thereby stock'd their Estates with Varieties of Game; but in such a Case we must always have Regard to the Nature of the Fowl, that such as are of the Water Race, are hatch'd and brought up under those Kinds as love the Waters, such as Ducks, Geese, &c. and Pheasants, if possible, to be hatch'd rather under Turkeys, than Hens of common Poultry, for the Food of Pheasants is much nearer that of the Turkey than of the common Hen, and the Time of Incubation is the same with the Turkey.

Of Water Fowls I find the greatest Variety about the Fern Islands near the Coast of *Northumberland*, and by the Sea Side in *North-Wales*; for the first, one of my Acquaintance has more than once receiv'd Eggs
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of above thirty different Kinds, box'd up in Bran, which he hatch'd, and brought to that Perfection, that his Pools are now plentifully stor'd with them, altho' they have not the Advantage of Salt Water.

The Breeding of Pheasants is generally thought to be so difficult and expensive, that few will undertake it, which perhaps may be, because the common Method, prescrib'd for breeding this Sort of Fowl, is so unnatural to them, that we seldom have more than one fourth Part of the young ones come to good; and yet I find 'tis still practis'd in some famous Pheasantries, where the Expence amounts to much more than the Value of the Fowls that are produc'd: But in this, as well as other Things, we find that the more we swerve from Nature's Rules, we are more distant from Truth, and Profit, and too frequently we find Men involv'd in Error, when they prefer Art to Nature. It is observ'd by Men of Judgment, that the most useful Discoveries were in Nature before they were discover'd, and that no Art is just, whose Foundation is not natural: One Instance of this may be pretty well explain'd by what I have observ'd in the breeding of Pheasants about my own House: I bought a good Number, with a Receipt for their Management, according to Art, *viz.* that they should be fed with Paste, made with Pollard, Milk, and a common Hen's Egg, which, as I was told, would make them lay plentifully; now, whether by this Means, or according to the Nature of Fowls, which have their Eggs constantly taken away, they

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were prompted to lay more Eggs than natural, I know not, but every Hen brought me thirty at least; so that I had always Eggs enough from every Pheasant, to set under two Hens of the common Poultry; however with all the Care I could take, I had not a fourth Part of the Eggs came to the Perfection I desir'd, 'till one of my Hen Pheasants, by Accident, got abroad, and stole her Nest, which she kept undiscover'd, 'till she brought out fifteen young ones, that I suffer'd to run with her two or three Days without Controul; but I was ignorant enough then to imagine, I could contribute to their Welfare, by retrenching their Liberty, and giving them richer Diet than they naturally fed upon, besides my preserving them from Vermin: I therefore took the Hen and her Young, at Roosting-Time, and put them in a Place of Shelter, but the Morning following, I found my Mistake, the Hen had destroy'd every one, by wounding them in the Head with her Beak. From hence I learnt how necessary it is to treat all created Bodies in the Way most natural to them; and I have found since by Experience, that where pinnion'd Pheasants have had due Liberty allow'd them, and not more than one Cock to seven Hens; they have brought their Young to Perfection for a trifling Expence; but the common Way prescrib'd, has always the same ill Share of Fortune.

When I shall come to be more particular in such Points of useful Knowledge, as relate to Husbandry and Improvement of Estates, I shall endeavour to do Justice to that admirable

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able Work of Capt. Perry's at *Dagenham-Breach* in *Essex*, the stopping of which was so long attempted in vain, 'till his extensive Genius gave him the Glory of finishing it in the greatest Perfection; and then, from some Examples of low Grounds, which have been overflow'd in other Parts of the Kingdom, I shall give such Hints as I am able to draw for the Improvement of this great Tract of Ground, when it becomes fit for Cultivation.

To this, I shall add the Descriptions of some Engines, contriv'd and invented by Mr. *Harding*, near the Water-Side in *Southwark*, for draining of Lands, which shew him a great Master in useful Science, especially in Mechanics, where he has the Advantage of excelling most Men in *Europe*.

There is one Thing more which requires our Observation, and demands our Study, relating to the Use of Water, where the Ground about it is upon a Flat; where this happens to be under Government, so as to be confin'd within proper Bounds, it will turn to extraordinary Advantage to the Proprietor. A Case of this Nature is now bordering upon an Estate of the present Earl of *Warwick*, which lies between *Kensington* and *Hammersmith*; where we find a Common-sewer, reaching from the *Thames* as far as the *Oxford Road* near *Acton*, and crossing the great Road from *London* to the West of *England*; all the Land on one Side is belonging to his Lordship. This Shore has been made Navigable for near a Mile in Length, by private Hands; and was his Lordship

disposed to continue it in the same Manner to its Extremity, there is no Doubt but his Lands would be extremely improv'd, and probably be enrich'd by Buildings, and at the same Time, save the Wear of the Roads, and turn to the Farmers Profit; who might with the Benefit of Water-Carriage, supply their adjacent Farms with Necessaries at cheap Rates, and transport their Crops to the best Markets with Ease and with Safety; but especially if they consist of soft Fruits, as Strawberries, Cherries, or other Kinds of tender Garden-Stuff, which is chiefly the Study of the Husbandmen thereabouts: We might add still the Advantage which might arise by bringing Coals and other cumbersome Commodities by Water, to the Inland Parts, which would save the Expence of Horse-flesh; but I shall consider this more fully, when I come to treat of the Use of some Rivers which lately have been made Navigable. Nor in the Course of this Work will there be omitted those Methods which have been used in the compiling the most curious Water-works, whether in the Structure of Cascades, Jet d'eau, or other useful and ornamental Inventions, depending upon the Laws of Hydrostatics; but especially of those Machines, which are the least crowded with artful Devices in their Construction, and consequently are the least subject to Repairs; for Nature in herself is simple, constant and lasting, and therefore the more simple any Piece of Machinery is, so much the more it is durable and useful.

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The Situation indeed of some Places disposeth them so naturally to these useful Ornaments, that the Artift has no more to do than barely to contrive the nearest Way of making a Communication between one Part and the other; so that there may be a strict Correspondence between all the Parts, to afford the most beautiful and useful Cascades.

We have an Instance of this Kind at *Mamhead*, the Seat of *Thomas Balle, Esq;* in the County of *Devon*, which, besides all the natural Ornaments, which can be imagin'd or desir'd to render an Estate beautiful, has the Advantage of some Springs, lying several hundred Yards above the House and Gardens, upon so high an Hill, that I have been told by the Country People, 'tis the first *English* Land which the Sailors discover in their Way Home from the Bay of *Biscay*.

On the Edge of this extraordinary Hill, the curious Gentleman beforemention'd, has directed the clearing and opening of two or three Springs which afford Water enough in the dryest Season to furnish large Reservoirs; from whence, after a Fall of many Yards, the Water comes to a Level with the Top of another Hill, which is of the Figure of a Sugar-Loaf, and whose Base exactly backs his Garden, and defends it from North and East Winds: On the Top of this second Hill, is Room enough to make a Bason capable of containing more than one hundred thousand Tun of Water, so that there may be a sufficient Quantity to furnish a Cascade, for eight or ten Hours every Day; the Height of this Hill is upwards of one hundred Yards
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perpendicular; which made me advise rather to have the Water fall in Cataracts of about twenty-five Foot a-piece, than to slide gently over Steps; each Cataract to be at least fifteen Foot wide towards the Top, and to spread in Sheets about forty Foot at the Bottom; for about the Middle of this Hill, there is the Command of two powerful Springs, which flow perpetually, and may strengthen the Body of Water which comes from the Top, so as to play three Times as much as the upper Reservoirs can do; besides, if the upper Reservoirs should want Water, the second of themselves would give a good Appearance.

To this, we may add, that the Hill I speak of is cloath'd with well-grown Timber-Trees of most Kinds, and border'd at the Bottom next the Garden, with a Gallery of tall Elms, cut (as the Gardeners term it) Fan-Fashion; thus we may say the Beauty of this Hill is rather beholden to Nature, than the Study and Labour of an Artist; and yet there is no Figure which one would sooner covet in this Way, than a Cone or Pyramid, to shew us a compleat Pillar of Water in Cascade.

But as much as this is beautiful and agreeable, for a little Expence, it carries an extraordinary Benefit along with it, *i. e.* its Use in watering the better Part of the Estate at Pleasure, which, in some Seasons, will prove very advantageous, for Grass-Ground especially; for in the Design of this Cascade, it is so contriv'd, that every single Sheet or Cataract of Water is to fall into a Receiver as may hold a large

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a large Quantity of Water, which may, by a small Sluice, be let into a Channel that leads to the upper Part of some Field or Orchard, so as to refresh the whole; for the Grounds as well Fields as others, which are within the Reach of this Benefit, lie gradually sloping, in such a Manner, as that every Part of his Orchard and Gardens may partake of the Advantage of these Water-works, which, for the most part, may be made to fall in finer Cascades than are commonly to be found in *England*.

While I am considering this Estate, I cannot help observing two or three Things uncommon enough; first, that the superficial Stratum of Earth is seldom more than nine Inches, before we meet with a red Rock, which, while it is under Ground, is very hard; but it is observ'd in some Buildings which were made of it, about forty Years ago, the Air has occasion'd it to molder and fall to Pieces, and yet the Estate is plentifully supply'd with valuable Timber of all Sorts, planted for the most part by Sir Peter Balle, Grandfather to the present Possessor.

Secondly, That notwithstanding this Shallowness of good Soil, the ever-green Oak thrives there so well, that the oldest of them have not been planted (as I am inform'd) more than forty Years; the Diameter of the Trunks measure above a Foot; but indeed few of these grow so upright as one would wish, except one of them, which (perhaps came from Seed in the Place where it stands) is about fifty Foot high, with a strait taper Stem without a Knot. I remember to have
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seen some Hogsheds made of the Wood of these Trees, when I was last in *Devonshire*, and brought some of it with me to Town; the Grain of it is like the finest Wainscot, but it is so very hard to work, that I question whether we have any harder Wood of *English* Growth, unless it be Box; and I am inform'd that the Cooper, who made the Vessels I have mention'd, had almost double the Trouble in setting and working this Wood, than he usually had in working our common *English* Oak; but I doubt not if he was to follow the ingenious and useful Method, lately contriv'd by Capt. *Cumberland*, for softening and bending of Planks, for the Use of Shipping, he would succeed much better.

The Invention of the Captain's is founded upon so much natural Reason, that I think it but common Justice to publish it, that every one may bear a due Regard for the Author of such an useful Contrivance; and especially, since it is no more a Secret than what is daily expos'd to publick View in his Majesty's Ship-Yards in the River *Thames*.

The common Method of bending of Plank, by burning, is not only expensive and tedious, but consumes Part of the parenchymous and spongy Texture of the Plank; so that the longitudinal Vessels in the Wood, which render it tough and capable of bending, want that necessary Support on one Side, which Nature furnishes it with; but in this new Way, there is nothing lost, the Planks or Timbers still possess all the Force and Power which Nature at first gave them; the

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Expence is much less, and the Labour insignificant; for what in the common Case us'd to take up as much Fire and Workmanship as amounted to near twice the Value of the Plank, is now brought so easily to the design'd End, that a Plank of four Inches thick can be brought to its Bow in a few Hours with very little Trouble.

The Captain's Method is by sweating the Plank in Sand, under which he keeps a moderate Fire, 'till the Juices of the Wood, which were at first fix'd and stagnated, are become fluid or duly moisten'd; when a Plank is thus prepar'd, it is taken out of the Sand, and brought to its Bow while it is warm, and will remain in the same Figure when it is once cold, without Binding or Restraint.

But, thirdly, I come to take Notice of the Method us'd for transplanting of a large Number of ever-green Oaks, which were about thirty Foot high, and had stood in a Nursery about twenty Years, without any Culture; which I believe is the first, if not the only Attempt of this Kind, which has been practis'd with Success, and is purely owing to Mr. *Balle's* good Judgment.

In the Year 1719, this Gentleman, early in the Spring, order'd these Trees to be taken out of the Nursery, with as much Earth about their Roots as possible, and to be convey'd, with Care, to the Top of an Hill of considerable Height, where he had Holes ready prepar'd for them, and Banks rising near a Foot above the Surface, consisting of the superficial Earth about one Part, mix'd with

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red rocky Soil : The chief Things he regarded in this Plantation, was to see them set no deeper in the Ground than they were before ; to fix them well with Stakes, and give them Plenty of Water. The Trees thus planted were near a Hundred ; but lest this new Experiment should miscarry, he counterplanted the Avenue with *English* Oaks, with the same Care ; but the Effect was very different, for I did not observe above four of the Ilex or ever-green Oak that fail'd, and there was hardly so many of the *English* Oak that liv'd ; and I believe, in some Cases, large Trees may be transplanted with much more Safety than small ones, if due Care be taken in their Removal, tho' indeed the Expence will be much greater ; but in some other Monthly Paper I shall give some particular Instances, when I have fully examin'd three or four Tryals that were made two Years ago. But, before I leave this Place, it is necessary to observe how much it is beholden to Situation for a gentle and vegetative Air, by lying open to the South Sun, and within two Miles of the Sea, which at that Distance yields very great Advantges, by affording a due Proportion of its Vapour to mix with the Land Air, even so as to keep off the Violence of Frost ; for I suppose it is with Air as it is with Water, that the Salt Water of it self does not freeze, but the Parts of the Sea, which are near enough, and capable of mixing with large Rivers of fresh Water, will freeze, more or less, as they mix with the fresh Water ; so I suppose that the Vapours arising from the salt Water, mixing themselves, more or less, with the Vapours
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arising from the Land, or fresh Water, defend the Body of Air they mix with, in certain Proportions, from the Rigour of the Frost. As an Example of this, we find that in this Part of *Devonshire* the Snow will seldom lie upon the Ground above 24 Hours; in this happy Climate, therefore, I have advised the Planting of a Vineyard of early Grapes, on the Side of a rocky Hill, such as the *Morignon* and those Kinds, which ripen in the open Grounds in the North Part of *France*; for from what I can judge of the *Devonshire* Clime, the Air is more benevolent than in those Parts of *France* which I have mention'd. But that we may yet better comprehend how much the Temperature of the Air ought to be consulted in the Culture of Vegetables, I shall insert a Letter I receiv'd from a curious Gentleman, relating to some Observations on Soil and Air.

To Mr. BRADLEY, F.R.S.

S I R,

AS we have often had Opportunities of conversing about the Difference of Soils, and of the Temperature of Air, requir'd for the Production and Nourishment of Vegetables, I here send you, as near as I can remember, the Sum of our Arguments, with some Remarks I have made upon them.

To begin then; you seem'd to be of Opinion that it was not the Soil or Earth it self which afforded sufficient Provision for the several Plants or Vegetables, but that there

were residing in every Earth, some agreeable Juices to nourish Plants of different Kinds; and as those Juices were more or less abundant in that Earth, or had different Qualities, so the Vegetables planted in it would be more or less vigorous: These Juices, or Salts, you suppos'd were furnish'd by the Air, and put in Action by the Sun; to prove which you refer'd me to the following Experiment, said to be *Helmont's*, related by Mr. *Boyle*, who dry'd two hundred Pounds of Earth, and planted a Willow of five Pounds Weight in it, which he water'd with Rain, or distill'd Water; and to secure it from any other Earth getting in, he cover'd it with a perforated Tinn Cover. Five Years after, weighing the Tree, with all the Leaves it had born in that Time, he found it to weigh one hundred sixty nine Pound, three Ounces; but the Earth was only diminish'd about two Ounces in its Weight. This Experiment I found, as you directed, in Mr. *Derham's* Physf. Theol. p. 61. I have made some others of the same Kind, and find the Plant has little more Use of the Earth it stands in, than the keeping it fix'd and steady; but then, as Earths are more or less binding, the Salts or Juices proper for Vegetation have less or more Liberty to act. From Experiments of this Kind one might come to a reasonable Judgment how much a Tree increases in every Year of its Growth, and how much it improves in Value; but I shall leave that to be consider'd more particularly by your self, only offering this Hint, that the Earth, after the Tree is drawn from it, must be weigh'd in the same State it was in when

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when the Tree was planted in it : The fairest Way I think is to make it as dry as possible, in an Oven, at both Times; this would likewise lead us into many curious Speculations, as that the fine Body of the Air should become dense as Water in the Vessels of the Tree, and from that State be fix'd, and become solid as the Wood of a Tree. I think it is almost demonstrative, that the vegetable Nourishment is principally in the Air, from the foregoing Experiment; the two Ounces of Earth lost, might perhaps remain on the Sides of the Case the Tree was planted in, or upon its Roots, or in the Weight of two hundred Pounds I think two Ounces may easily be lost, unless both the Scales and the Weigher are very exact; or in the baking or drying of the Earth, there might be two Ounces more of Moisture found in that Quantity of Earth, one Time than another.

Thus supposing 'tis Air which feeds and nourishes Plants, and from the Instance you have given me of the Tree Sedum, which will take Root, and live, without Earth or Water, for several Years; I come to consider how much the different Changes and Alterations of Air work upon Vegetables. In the Example of a Piece of the Sedum Arborescens, hung up at Mr. Fairchild's, Hoxton, which you say shoots out its Roots when the Air thickens and tends to Rain; this I have so far experienc'd, that I am perswaded it is constantly so; and I have try'd other Sedums, which proportionally do the same; but it is difficult to determine whether

ther the different Quantity of Moisture, contain'd in each of the Kinds of them, may not, upon one certain Temperature of Air, be dispos'd to exert it self to the utmost of its Power in each respective Plant; or whether, according to the different Textures of the several Plants, every one is not empower'd in its own Way to receive a certain Impulse, or distinct nourishing Quality from the Air, which the rest cannot equally share of. In some Conversation I have had with you, I remember you was of Opinion, that the Vessels of each distinct Plant were different from those in the others, and that those Vessels were in every Plant capable of filtering the Juices they receiv'd from the Air or Earth, in such a Manner as to alter their Parts, and vary their first Powers: To which you offer'd me as Examples; first, that 'twas possible to make Plants live in almost any Air or Soil, provided the Air it self was not too much pent up or stagnated; from whence I suppose that all Bodies of Earth are more or less capable of imbibing the fluent Air, and of attracting such Salts as either the Air can give, or the Earth is capable of receiving; when these Salts (however they come into the Earth) are lodg'd in Grofs, or in a Body, the different Strainers or Vessels of the several Plants growing upon that Spot of Earth, thus impregnated with Salts, alter those Salts or Juices according to the several Figures or Dimensions of their Strainers; so that one Plant varies in Taste and Smell from others, tho' all draw their Nourishment from the same Stock lodg'd in the Earth. But I remember you remark'd farther,

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farther, that Earths themselves being of different Kinds, some Sorts could not take in so many of the nourishing Parts of the Air as others, and therefore the same Sort of Plant could not grow in every Soil with the like Vigour; that is, because every Sort of Earth has not the same Fund of Salts, or else that every Earth is not equally capable of distributing to the Plants growing in it the Salts it contains, with the same Freedom. Again, your Instance that Thyme and other Aromatics being planted near an Abricot Tree, would destroy that Tree, helps to confirm that every Plant does not draw exactly the same Share of Nourishment. *Virgil*, in his *Georgics*, gives us good Hints of the different Soils and Situations, necessary for Plants of different Kinds;

*Nec verò Terra ferre omnes omnia possunt :
 Fluminibus Salices crassisque paludibus Alni
 Nascentur : steriles saxosis Montibus Orni :
 Littora Myrtetis latissima : denique apertos
 Bacchus amat colles : Aquilonem Et frigora Taxi
 Aspice Et extremis domitum cultoribus orbem,
 Eoasque domos Arabum, pictosque Gelonos :
 Divisa arboribus patria —————*

and that Earths of several Kinds will imbibe certain Qualities from the Air, Mr. *Boyle* assures us, that the Earth or Ore of Allum being robb'd of its Salt, will in Tract of Time recover it, by being expos'd to the Air; which intimates something more than I have observ'd before, that every distinct Sort of Earth has even a Power of its own, of extracting

tracting from the Air Salts of particular Qualities, or else of altering the common Salts of the Air, according as its Parts are differently fram'd or order'd.

The other Remarks which I have made in this Way, I shall take another Opportunity of communicating ; and am,

S I R,

Yours, &c.

B. S.

And that I may omit nothing which may tend to the Pleasure and Profit of the Husbandman, or those curious Persons that admire a Country Life, I shall take Occasion to mention how far the good Management of Bees may contribute to their Master's Advantage, after giving a particular Account of the OEconomy of those wise Labourers ; for I think the Profit of their Wax and Honey, tho' it is very considerable, does not carry its full Value with it, if we disregard the Virtue, Diligence, and Contrivance of the Bees, who work it for us ; which we may observe with great Pleasure, by Means of the Glass or Box Hives ; which are so order'd that the Honey may be taken without destroying the Bees : But whether it is for the Master's Advantage to leave them alive, when they are robb'd of their Honey, or the greatest Part of it, is yet a Doubt ; for 'tis a Query whether the same Bees work two Summers, or even live so long, and if not, the Food they destroy in the Winter in so much Loss ; but this is worth Notice, and will be treated of in another Place. In the mean Time,

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I have been told that a Swarm of Bees accidentally fix'd a Colony in a large Wine-Cask, which had been carelessly set in the Corner of a Garden, and continu'd to work in it 'till it was quite fill'd with Honey and Wax; but I suppose the great Space in the Hogthead kept them from swarming, which would be a Means of their increasing greatly in Number, though all the Bees of a Year old were to die.

Among other Things which may be useful to Husbandmen, I shall take Care to describe several curious Contrivances of Carriages and Ploughs, which have been approv'd of by the most knowing Practitioners, especially where they save the Expence of Labour, which will be very serviceable in the Clays and other heavy Lands.

But I now proceed to make some few Remarks upon the State of the Weather, for the four last Months, and to shew what Effect it had on the Fields and Gardens about London.

January, contrary to Expectation, was this Year so mild and free from Frosts, that Beans, Pease, and Cabbage-Plants, began to take the same Freedom of Growth which they us'd to do in *February*; thus were these Plants fill'd with fluid Sap, and became more liable to receive Injury from Frosts than if they had been timely check'd.

While they were in the growing State, a severe Frost attack'd them, which lasted the greatest Part of *February*, and cut them down to the Ground, past Recovery; so that the Gardeners and Husbandmen were oblig'd to renew all

these natural Crops, unless such only as were but just rising out of the Ground; *March* afforded nothing but cold Rains, rough blighting Winds and stormy Weather, which kept most Plants at a Stand, 'till *April* introduced hot close Weather with gentle refreshing Showers, which brought us a sudden Spring; but through the Irregularity of the foregoing Months, it is observable, that natural Asparagus did not appear 'till about the fifteenth Day, which is more than a Week later than usual.

Most of the Spring Flowers were cut off, especially Ranuncula's and Annemonies, and Carnations were extraordinary Sufferers.

The Crossness of the Season had also an extraordinary Effect upon the hot Beds, so that many ingenious Gardeners, who were us'd to cut Cucumbers in *March*, were disappointed in their Crops; but this Misfortune of some, gave me Opportunity of hearing the Fame of Mr. Gilman at Brentford, who, by his Care and good Judgment, brought ten Dozen of large Cucumbers to Market in *March*, and has continu'd to supply the Town to this Day, though the Neat-house Gardeners are now only beginning to cut.

To this, we may add, that about the End of *March*, Kidney-Beans, rais'd in hot Beds, were sold in *Covent Garden* Market, for about two Shillings Sixpence per Dozen; and Mushrooms were bought for eight and ten Shillings a Basket in *St. James's* Market, which were raised artificially in Beds, as the Gardeners do about *Paris*; but I have now instructed several Gardeners in the *French* Method, and hope, for

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for the future, to find them constantly plentiful.

Among other Rarities, some Cherries have been brought to Town near a Month ago, having had the Benefit of forcing Frames.

We may now likewise take Notice of the *Brocoli*, or Sprout-Colyflower, or, as some call it, the *Italian Asparagus*; 'tis a Plant which has been cultivated privately in some few Gardens in *England*, for about three Years, and has now gain'd so much Fame, that I judge, it would be worth the Gardeners while to propagate it for the Markets. I have observ'd two or three Sorts of it, viz. one which yields Sprouts button'd at their Points, or headed like small Colyflowers; one Sort with curl'd Leaves, and brings Sprouts button'd on the Points like *Asparagus*; and the other with curl'd Leaves of a pale green Colour, which yield Sprouts like the red Kind; the Seeds of these last Kinds may be had at the Crown, an *Italian Gardener's*, behind *Buckingham House*, near *St. James's Park*, which I mention the rather at this Time, because it is not yet too late to sow the Seeds; but 'tis rare to find the Seeds of the first Kind, unless in the Hands of some Gentlemen, who have them every Year from *Italy*: They are all to be dealt with like Colyflower Plants; but concerning their Use, and the Method of preparing them for the Table, I am drawing up a particular Account, with some other Things, proper for a curious Kitchen Garden, for a Person of Honour, which I shall publish in due Time. But because I am sensible there are many Things in

these extensive Arts of Husbandry and Gardening, which may be better explain'd by Experiment than by plain reasoning, such as pruning of Trees, Ways of grafting, transplanting, forcing and raising of Water, &c. I am preparing a Set of Experiments, which I shall be ready to communicate to the Publick next Winter.

But before I conclude this Month's Observation, I shall mention two or three Experiments which may be of some Pleasure and Use to my Readers.

The first is, concerning a Cherry-Tree which was made to bear Fruit in Autumn, as I have been inform'd by a Person of Credit, who told me, that in the West of *England*, there was a large Cherry-Tree growing in a Farm-Yard, which was so little regarded by the Owner, that when it was in full Bloom, he suffer'd the Boys to pick off the Blossoms to make Garlands against some Wake or Fair which then happen'd in the Country, and to his great Surprize, towards *August*, the Tree put out fresh Blossoms, and the *October* following, was full of Fruit; which he supposes, happen'd from the Check that was given to Nature in the foregoing Spring, in pulling of the Flowers; by which Means he judges, that the first Intent of the Tree being stopp'd before the Juices had spent themselves in the Fruit or Flowers, the Tree became then of a sufficient Strength to perfect its Design in a second Essay, and to act in Autumn, even with more Vigour than it would have done in the Spring.

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I have practis'd the same designedly upon Raspberries, and Strawberries, and find, they will bring Autumn Fruit to perfect Ripeness; and have had more than once, the *Morello* Cherry accidentally ripen'd with me about *November*, which I suppose, came from some Check of the like Nature, either where the Spring Blossoms had been broken off, or had been destroy'd by a Blight. Nor is it uncommon for Pears to blossom about *Midsummer*, and set their Fruit, but they seldom come to Perfection.

The Vines of the *Canary* Grape will now and then put out second Bunches of Blossom about *August*, but in the natural Ground in our Climate, they come to nothing; I believe nevertheless, with the Help of artificial Heat, they might be brought forward: For I suppose, 'tis natural for this Vine to bear Fruit twice a Year in the hotter Climes, as I am told, that some do in the South Parts of *Italy*.

One Thing relating to Vines, I shall take Occasion to remark in these Papers. A Friend of mine had a Parcel of Vine-Cuttings, which he had kept without Earth for near two Months, and accidentally remembering them towards the Beginning of this Month, put them all together into his hot Bed, where they had not been much longer than a Week before they made Roots, and began to bud. A Fortnight after, their Shoots were vigorous, and promising of making Branches of great Length, though he took them several Times out of the Earth, to shew what Roots they had got. But there remain'd a Difficulty
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in transplanting them in due Time into proper Places; for as they were in Leaf, the common Ground would not be sufficient to maintain them without Artifice; I therefore advis'd him to transplant them into Pots, and give them the Continuance of an hot Bed, hardening them by Degrees in the Summer, but with this Regard to the tender Roots, which were full, and of a whitish Colour, that they should not have Time to dry before they were set in the Pots, nor suffer the least Bruise, and I reasonably imagine, they will make Plants this Summer, fit to bear Fruit the next. But I have recommended this Experiment to several, who are now in the Practice of it; and as Occasion offers, I will give an Account of the Success; the Pots I mention, will secure their Transplantation without any Check at any Season, because they may be set in the common Ground, with the Earth about their Roots.

Another Experiment I made the Year 1720, to facilitate the raising of Vines from Cuttings, by Means of common soft Soap; and I cannot help recommending it now in a particular Manner to the Curious, that they may begin early enough. The young Shoots which appear in *May*, however tender they are, may be taken from the Vine, and after the lower Leaves are taken off, the whole Part which is to be set in the Earth, must be well soap'd and planted in a fine Earth made into a Mud by common Water, for the Water of Dunghills will destroy 'em; these will take Root in less than six Weeks in the common Earth: But I believe, from the fore-

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foregoing Observation, if they had the Assistance of a hot Bed, they would do Wonders, for Soap is of great Use to Vines, as I have already experienc'd; and what I have said before, serves in Part to confirm the Benefit they may enjoy from a Heat well regulated. I should however, observe, that my Friend's hot Bed was cover'd with Virgin Earth, near seven Inches deep, and that the Bed work'd with Gentleness, and produc'd a natural Heat, which must be the Work of Judgment: But as that is not in the Hands of every one who pretends to the Management of hot Beds, which sometimes burn, and sometimes cool too soon under their unskillful Care; I shall give a Specimen of a Contrivance of the curious Mr. Hall, which will, at the same Time, keep a Bed from burning of Plants, and give us Opportunity of shifting our Crop from Time to Time, from one Place to another, without Loss.

The Gentleman I mention, prescribes a Hurdle to be made somewhat bigger than the Frame for the Glasses, so that it may be fastned to the Bottom of it, that the whole Body of Earth which is necessary to lay in the Frame may lie upon the Hurdle, and be remov'd together with the Frame, from one hot Bed to another, as Necessity requires. The Hurdle lying thus at the Bottom of the Earth, will keep it from burning or scorching, although the Bed should fire, as the Gardeners call it, the Dung then being incapable of acting in Excess of Heat immediately

ly upon the Mould, or do any more than communicate to it its warm Steam,

Another Experiment which may be very properly made in this Month, relates to the Production of Lemons from the Kernels. I observe, that those Lemons which are brought from the hotter Countries, and are first ripe, begin about this Time of the Year, to decay and yield an insipid Pulp, in which the Kernels are so much forwarded to Vegetation, that even in the Fruit they strike out Roots, and tend to Growth. This put me in Mind, that the Pulp is of great Use and Assistance to the Growth of the Kernels, as well as to maintain the viscous Matter, which we always find about their outward Coat; and therefore I was resolv'd to try how far I could make it subservient to grown Trees of the same Sort, as well as assist those Kernels which I should sow with it.

I have from these Hints, recommended to two or three curious Gentlemen, the Use of the Pulp of full ripe Lemons, to be apply'd to the Roots of Lemon-Trees, and find already that they prosper exceedingly; but in the Removal especially of these Trees, which are usually apt to suffer very much by transplanting, I find, that by the anointing their Roots well with this Pulp, and laying some of it about them, they shoot with great Strength: And I am of Opinion, that were we to use the Pulp of Fruits in the same Way, to such Trees as were of the same Kinds, we should meet with extraordinary Success,
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for in the Fruit of every Plant is contain'd the most refin'd Juices of the whole Plant, which are such, that we find Nature itself designs to forward the Vegetation of the same Plant in the Seed; and therefore, if I had not already had some Experience of it, it would not be unreasonable to try. But we may take this further Remark along with us, that such Fruits are in the best State for such Use, when they grow rotten, or tend to Putrefaction. I design to try, whether the whole Quantity of Fruit which one Tree might bear in a Season, being laid (mix'd with Earth) about its Roots in *May* or *June*, will not give that Tree double the Strength in the following Year's Shoots, that it had the foregoing Year. About the Time I mention, we may find Apples, Lemons, Oranges, and some other Fruits which are only fit for this Use, and may get large Quantities for a trifling Expence. We are farther to observe, that at this Season, about *June* especially, Pears, Apples, and most Kinds of *English* Fruits are at a Stand in their Growth, and that then is the proper Time to lay such Manure about their Roots, for the new Fibres to strike into, which are alone the Parts of a Plant which take the first Nourishment from the Earth; but I shall take another Opportunity of speaking more largely upon this Subject.

I have at present no more to say than to repeat my Desire to all curious Men, either in Husbandry or Gardening, to communicate such Observations as they have made

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in those Arts, directed to the Publisher of these Monthly Papers, and I shall, with the greatest Respect, acknowledge their Favours, and endeavour to assist them with my Advice as far as I am able.



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A GENERAL
TREATISE
OF

Husbandry and Gardening,

For the Month of *May*.

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improve-
ment of Land.

WITH

An Account of such extraordinary In-
ventions, and natural Productions, as
may help the Ingenious in their Stu-
dies, and promote universal Learning.

*To be continu'd Monthly, with Variety of
curious CUTTS.*

By R. BRADLEY, *Fellow of the
Royal Society.*

L O N D O N:

Printed for J. PEELE, at Locke's Head, in
Pater-Noster-Row.

(Price One Shilling.)



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For the Month of May.



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To the Right Honourable the
Earl of *STAIRS*,
Knight of the most Ancient
Order of the Thistle ;

This GENERAL
T R E A T I S E
O F

Husbandry and Gardening,
For the Month of *May*,
Is most humbly inscrib'd by

His LORDSHIP'S

most Humble and most

Obedient Servant,

R. Bradley.

THE RIGHT HONOURABLE

To the Right Honourable the

Earl of STAIRS

Knight of the most Ancient

Order of the Thistle



THE RIGHT HONOURABLE

His Majesty's Secretary of State

For the Affairs of India

Is most humbly solicited by

His Majesty's Secretary of State

and Secretary of the Admiralty

Ordered that

R. Bradley



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A GENERAL
TREATISE
OF
Husbandry and Gardening.



As the Memorandums in the former Month were little more than what one might expect by way of Introduction to a Work of this Nature, which is design'd for the Improvement of Husbandry and Gardening, so I shall now begin to be more particular in my Observations and Experiments; and though I have already received several extraordinary Hints which relate to Husbandry from curious Persons, I shall still desire to encrease my Correspondence with them, and shall hope

hope, as this Undertaking is design'd for publick Use, their Numbers will be daily augmented; for I conceive there can be no surer way of propagating such Arts, than by getting together a faithful Collection of Particulars, and by making just Comparisons between those of one Country and those of another: And every thinking Man must certainly allow, that where the Materials are more numerous, we have more Opportunity of chusing good Things, and the Structure of the Building may be made so much more complete and useful.

But as I know that the Strength of Genius which abounds so much among the People of *Great Britain*, has not always the Opportunity of making its way and of doing good to the Publick; either because the curious Inquisitors happen to be Illiterate, or want a Stile of Expression, or that their Modesty will not allow them to publish their Experiments; I cannot help reminding them what a great Author of our Times observes, *i. e.* That our Nation has lost many useful Experiments and Inventions, through the want of Letters, or Courage in the Contrivers to make their Improvements known to the World; and he regrets that Loss like a true Lover of his Country, knowing that the Loss of every useful Invention is a National Loss; for as the Knowledge and Learning of a People is always the greatest Riches a Nation can possess, so we may judge what a melancholy State a Nation would be in, was it to be depriv'd of its best Artizans, and Men of Learning; it would then lie exposed to the Insults of Neigh-

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Neighbours only with this poor Guard for its Defence, that the Folly and Ignorance of the remaining People would subject it to Poverty, and then render it despicable in the Eye of their Neighbours, and fit for nothing but to be trampled on or brought into Slavery. It is therefore necessary for the Good of a Country, to promote the Study of Arts, and useful Knowledge, especially among such of the Commonalty who have a Genius towards the Improvement of Arts, and who have Industry enough to put their Knowledge in Practice; nor should any of their Attempts, if they tend to useful Knowledge, be disregarded, because the Workmen are low in Fortune or of mean Aspect, or are unacquainted with the Methods of making their Labours publickly useful. Such Men rather demand the Assistance of the more Learned, or the Influence of Great Men, to ripen their Undertakings, and bring them with Applause into the World.

The publick way I propose in these Papers, of furnishing the Curious with new Discoveries, will, I hope, be some Inducement to the inquisitive Part of Mankind, to offer their Remarks, which I shall insert in the best manner I can at proper Opportunities; and perhaps by this means, the true Authors of good Inventions may be preserv'd from the too frequent Pyracies of those Men who triumph in the Plumes of others; and, on the other Hand, we may bring to Light many Secrets and Contrivances, which, without this help, might lie for ever uncultivated.

But

But I must further observe, that in this Work, I shall not insert any thing which is related as Fact in the Letters I receive, without being fully satisfied of the Truth of it; and then in Justice to the Author, if he thinks proper, shall publish his Name, and the Place where the Experiment has been made, or where such Curiosity may be observ'd.

As to my own Observations and Reasoning, I shall be as careful as possible to make them intelligible; and if by further Practice, I shall happen to find any of them deficient, I shall endeavour to supply their Defects, by explaining them more fully; the Work which I have lately publish'd concerning Planting done by Dr. *Agricola* of *Ratisbonne*, has furnish'd me with many new Hints, which I am now bringing to Practice; and it is very likely may prove advantageous to those who apply themselves to the Study of Plantings, and improving the Growth of Trees.

We are obliged to this Gentleman for first publishing the Use of Vegetative Mummy in transplanting of Trees, though we have had something like that Mixture in Graffing; and for plaistering the great Wounds in Plants, such as the Graffing Wax mention'd by Monsieur *De la Quintinie*, and some others, practis'd by several curious Men. The Honourable *James Johnston* of *Twickenham*, Esq; has long since had a Mixture of his own Invention, which he has us'd with Success in Graffing, and apply'd warm, with a Brush, to the Wounds of Trees, where any Incision has been made; and I doubt not, but the same Preparation would be of Service in Graffing in the Root,

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which is a Method of propagating large Trees, which has yet been but little practis'd in *England*. Dr. *Agricola* has given us various Methods of performing this Operation, one of which I have already prov'd to succeed very well, when I try'd Two or Three Inventions of my own of the like Nature; but as I have not now Ground enough to continue such Tryals, so I am not able, at present, to determine the Success of his other Experiments, which some of my Friends have now in Practice, at my Request, but a Month or Two will give me Opportunity of viewing them, and declaring my Opinion; however, thus far I dare venture to affirm concerning Root-Grafting, that we have by that means an Opportunity of propagating many kinds of Plants, which, till lately, we have wanted Means to perform; and I doubt not, might serve to increase the Tulip-Tree, which has been so much admir'd at my Lord *Peterborough's* Gardens at *Parson's Green*, near *Fulham*; that Tree was the first that was brought from *America* into *England*, and blossom'd here: but my Lord *Pembroke* has now one of the same Kind at his Seat at *Wilton* in *Wiltshire*; and Mr. *Fairchild* tells me of another at *Waltham-Abbey*, in a Garden belonging to — *Jones, Esq*; which produces Flowers; but I cannot find that we have any more Trees of that sort in *Europe*, which are arrived at that Perfection, though there has been some Hundreds of them rais'd from Seeds in the Gardens of the late Mr. *Darby* at *Hoxton*, and at Mr. *Thomas Fairchild's* near the same Place; from which Places the chief Gardens abroad have been supply'd.

I have indeed seen some of the Tulip-Trees raised by laying the young Branches in the Earth, and I must needs confess, that the first who made tryal of it, had good reason of his Side; for allowing that the Layers would take Root, 'tis not to be doubted, but such Branches as could be lay'd in the Ground from grown Trees, would be more disposed to Blossom than young Seedling Plants. And, I think, this would be a good Method for raising any sort of Fruit Trees to make them bear soon; for I suppose the Sap which is found in Branches proceeding from large Trees, is more ripe for Production, and more capable of Nourishing and Impregnating the fructiferous Principles, which are fully prepared in the same Tree, than the green or undigested Sap in young seedling Plants could do, if these Plants should even contain Seeds in them which were fit for Action. But Nature is uniform in all her Works; we never find but that she ordains a certain Maturity of Qualities in the Female, before she is capable of producing her End by Means of a Male, who must likewise be fully mature and complete; for a Creature not yet arriv'd to Ripeness of Parts and Juices, cannot either impregnate or be impregnated by the contrary Sex, although that should be fully perfect. Suppose, for Example, in the Animal Kingdom, a half grown Chicken could be brought to Couple with one of a contrary Sex full grown, the want of Perfection in one would render that Coupling ineffectual; or could two Creatures of the same Age be brought to Couple in their unripe Days, they would

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would not produce any Thing; for in the first Case, supposing the Ungrown to be Male, the Parts of such Male are wanting of the Power of acting with natural Uniformity on the Matter of the full-grown Female; and in the latter Case, not only the Parts of both, but the Juices likewise are green and undigested, and both equally incapable of acting upon each other. But Nature, always regular in her Laws, has fix'd certain Periods of Growth and Maturity to every distinct Species under her Care, agreeable to which Limits the Parts of both Sexes are equally empower'd to perform their several Offices.

In the Animal Kingdom, Nature has given Local Motion; and 'tis seemingly for that Reason, that the Male and Female Powers reside in different Bodies. But in Vegetables, which live in a fix'd State, both these Powers seemingly reside in each Plant, though flowing in different Channels. What I have already said and experienc'd of the Generation of Plants, may explain more fully what I mean.

As in Animal Bodies there are several Degrees of Juices, which are more or less refin'd, according to the Largeness or Smallness, or perhaps Figure of the Vessels they pass through; so in Plants we find Vessels of different Functions, which, like Filters of different Kinds, separate and alter the Juices which pass through them, so that they may separately be distinguish'd by the Senses, although they all originally proceed from the same Fund of undigested Juice in the Root; and the more time these Juices have to open

and nourish the several Parts they pass through, so both the Parts and Juices become more perfect, and draw nearer the Point of Maturity, which Nature has fix'd for their Perfection. In this Progress those Parts equally ripen, which are to be acted upon, as those do which are to act.

But some may object, that all Plants cannot be raised by Layers, and if even Grafting on the Roots of other Plants would do to propagate Trees, yet those Roots so grafted would not perhaps have Sap in them sufficiently disposed to bring the Grafts to speedy Bearing. But in answer to this, we are only to consider the Roots, which we use for this purpose, as so many Funds of Vegetable Matter, which is to be filter'd through the Vessels of the Cions, and digested and brought to Maturity, as the Time of Growth in the Vessels in the Cion direct; for a Cion of one kind grafted upon a Tree of another sort, may be said rather to take Root in the Tree it is grafted on, than unite it self with it; for we see the Cion preserves its natural Purity and Intent, though it feeds or is nourish'd from a meer Crab, which is certainly occasion'd by the difference of the Vessels in the Cion from those in the Stock: And therefore we may compare Grafting very justly to Planting. A Dozen of Heart Cherry Trees, for Example, planted in as many different Soils, each of those Trees, though the Juices of those Soils are all different, will yet preserve its natural Bent of bearing Heart-Cherries, or do the Physicians always take Notice, that any particular Herb alters its Virtue for
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being cultivated either in Sand, Clay, Gravel; or any other kind of Land ; generally supposing that the Strainers of every distinct Species of Plant so modify the Juices of the Earth it grows in, as to afford the same Virtues in all of one sort, let the Soil be never so different.

In Dr. Grew's and *Malpighius's* Anatomy of Plants, as well as in those Plants I have traced with the Microscope, one may discover Parts in each distinct Plant, of very different Frame and Texture from one another ; and then we may as surely conclude, that those Parts differing from one another, are design'd by Nature for different Functions ; for it would be as unreasonable to suggest, that all the Parts of a Plant do the same Office, as it would be to suppose, that a Bone acted the same Part as an Artery, an Artery as a Muscle, a Muscle as a Vein, or a Vein as the Lungs of any Animal ; and, in my Opinion, there is nothing more necessary than a right Understanding of the Anatomy of Plants, for those who would cultivate them; for how would it be possible for a Physician to cure the Distempers incident to human Bodies, or prescribe them Rules of Health, unless he first knew their Frame and Constitution.

Among Plants it must be as impossible to improve their Growth, or give them (or preserve in them) a State of Health : as in the Case of Animals, if we do not consult their Frame and Texture of Parts, and the natural Food or Soil they require ; it is therefore I shall take Occasion to hint some few Remarks relating to the Parts which are generally observ'd in them.

Dr.

Dr. Grew tells us, all kinds of vegetable Principles are at first receiv'd together into a Plant, but are afterward separated, *i. e.* filter'd, some from others, in very different Proportions and Conjunctions by the several Parts; so is every Part the Receptacle of a Liquor, become peculiar not by any Transformation, but only the Percolation of Parts out of the common Mass or Stock of Sap; and those which are superfluous in any Plant are discharged back by *Perspiration*.

The same learned Doctor ascribes to every different kind of Vessel a distinct Office; he tells us, the Lymphæducts, which carry the most watry Liquor, are placed on the inner Verge of the Bark, next to those which he calls Air Vessels, *I suppose from their Smallness, which will not admit the Passage of any Fluid denser than Air.* He adds, the Lactiferous or Resiniferous Vessels do usually stand in the Middle, between the inner and outer Verges of the Bark. His Lymphæducts, *I suppose,* are what I call the new forming Vessels which are produced annually, and help to encrease the Bulk of the Tree. The Lactiferous and Resiniferous Vessels, *I suppose,* serve to return the superfluous Sap, as I have already hinted in the first Chapter of my New Improvements of Gardening, and in a Memorial which I delivered to the Royal Society about Three Years since, concerning the Vessels which run Longitudinally in the young Shoots of an Apple Tree, and has since been publish'd in the *Philosophical Transactions*, with a Figured one with the Microscope.

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Fig: II

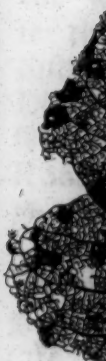


Fig: I

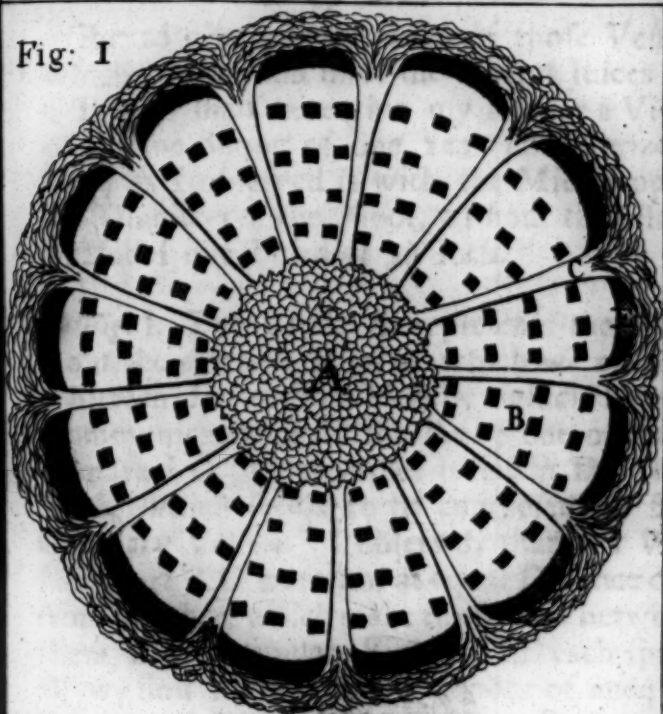
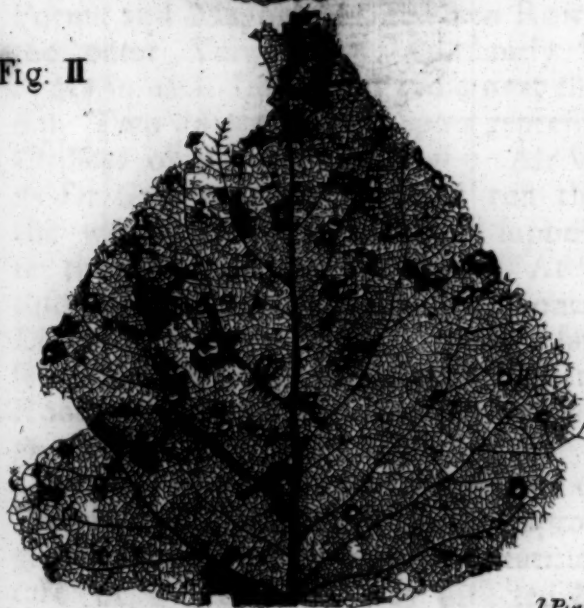
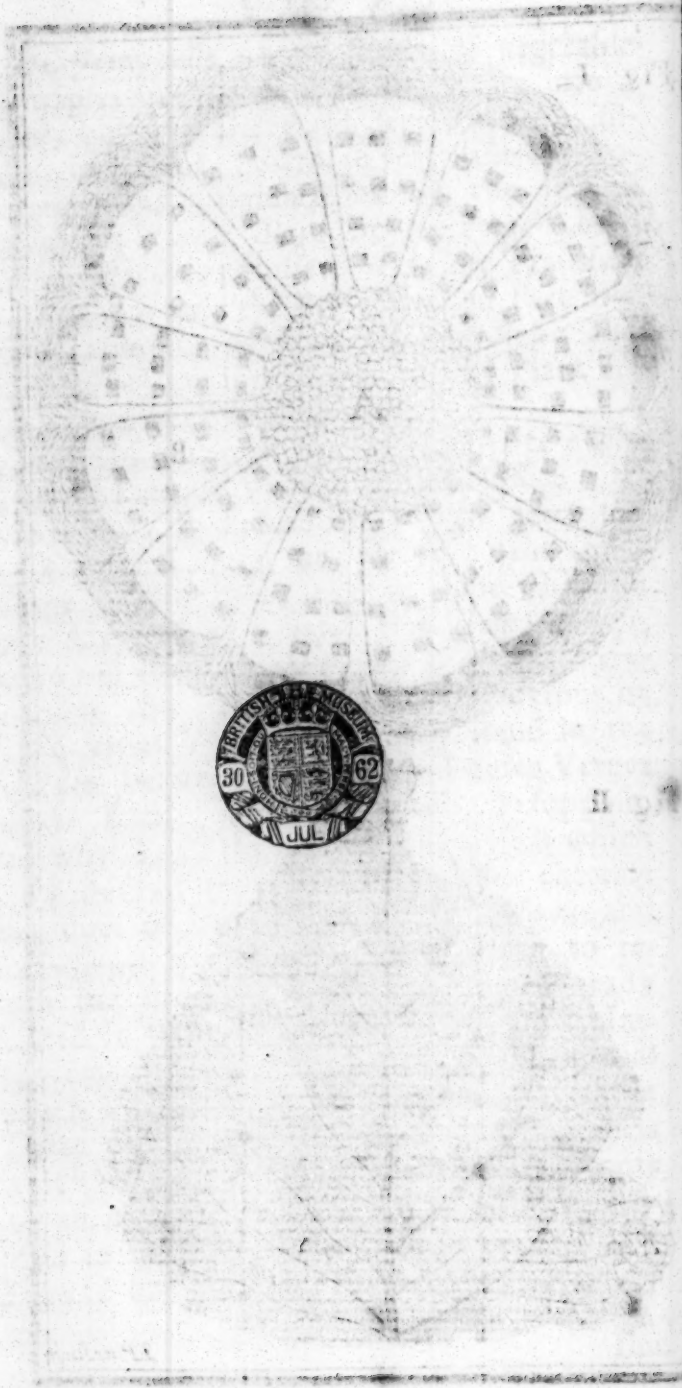


Fig: II



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But to give a better Idea of those Vessels which convey and filter the several Juices in a Tree, I shall here give my Reader a View of a Vine Shoot of one Year cut Horizontally, as I observed it with the Microscope; the Diameter of the Shoot, without the Glass, measured one Third of an Inch.

Fig. I. The Circle A represents the *Pith*, from the extreme Parts of which we observe Thirteen Latitudinal Vessels, which have a Communication with the *Bark*; one of them is mark'd C, which looses it self in D or the *Bark*, which seems to be composed of fine Capillary Vessels. I observ'd, that the Vessels mark'd C were not at equal Distance one from another, which make the Spaces between them B of irregular Figure. In each space B, we find Four Rows of Spots of unequal Forms and Magnitudes, the two Rows next the outer Verge have constantly Three Spots in each Line, but those next the Pith only Two apiece: These Spots represent the Orifices of the Longitudinal or Air Vessels, as Dr. Grew calls them, which run through the woody Part, and which, I suppose, filter the finer Juices of the Plant. At E we discover some Passages capable of containing Liquor as dense as Water; these, I suppose, serve to return the superfluous Sap to the Root, and, I suppose, are Dr. Grew's *Lymphaducts*.

When we have observ'd this Figure of the Wood, I conceive it will not be improper to give my Reader a View of the beautiful Texture of a Leaf, as it was dissected by the Insects

Insects which blighted it; which were so small, that they were only capable of eating the most tender Parts, and leaving such minute Vessels untouch'd, as are scarce discernable without a Microscope; so that 'tis easy to guess at the extreme Smallness of the Insects which fed upon this Leaf, and which at some other Opportunity, I shall describe in a more particular Manner.

Fig. II. Shews us the Texture of a full-grown Leaf of the Lime Tree, whose fleshy Part was destroy'd by small Insects. In this we may not only observe the Ramifications of the Sap Vessels, which hold a close Communication with each other; but in several Places discover the Egg Nests of the Insects, which devour'd the fleshy Parts. Dr. Grew observes, that the Fibers of a Leaf are composed of the two general Kinds of Vessels, viz. for Sap and Air; and these as well as other Vessels in Plants, are ramified out of Greater into Less, as Veins and Arteries are in Animals. It is likewise the Opinion of some great Men, that the Vessels in the Leaves of Plants are inosculated not Side to Side, but the Ends of some into the Sides of others; but this is not really done, the smaller Threads being only so far deducted, as sometimes to stand at right Angles with the greater, so that they are only inosculated End to End, or Mouth to Mouth, after they are come at last to their final Distribution.

It is to be observ'd farther, that the Vessels are the chief Viscera of a Plant; and as it has several Liquors, those Liquors become
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differently qualified from the divers Kinds of Vessels; and that as the *Viscera* of an Animal are but Vessels conglomerated, so the Vessels of a Plant are *Organes* drawn out at length.

Moreover, it is remarkable in many Cases, that the Multitude and Largeness of the Vessels produce a sweet and winy Sap, and the Fewness and Smallness of the Vessels an oily Aromatick. Dr. Grew supposes, that the Odours in Plants proceed chiefly from the Air Vessels in the Wood; not but that the other do also yield their Smells; which is most perceptible in fresh, undry'd and unbruised Plants. For, says he, the Air bringing a Tincture from the Root, and from the several Organical Parts along with it, and at last entering the Concave of the Air Vessels, it there exists. It is not to be deny'd, that the *Effluvia*, which can be admitted into the Wood Vessels, may give a Smell to the Wood, and that as that *Vapour* passes through Vessels of different Structure, so as to alter the Form of its Parts, so in every one of its Changes it will yield a Smell different from the rest; the Smell of the Wood will be different from that in the Bark, in the Juices in the one being more essential than the other; but both being bruised and mix'd together, yield a Scent differing from either of them singly. So the Leaves give us a Scent different from either of the former, as the Flowers do from that in the Leaves, and the Fruit from that of the Flowers. It is necessary, moreover, to the Nutrition of Plants, as in Animals, that there should

be a Concurrence of two specifically distinct Fluids: These, says a learned Author, with good Reason, are interwoven in every Part of a Tree in their proper Vessels, like *Linsy-Wolsey*; so that every the least Part of Sap is impregnate with divers essential Tinctures, as it is continually filter'd from the Fibers of one Kind to those of another. We may observe in *Figure* the First, very plainly, the Insertions of the Cortical Body as they run from the Center to the Circumference, which in other Subjects are (visibly) braced and interwoven together by capillary Tubes with the Longitudinal Vessels of the Wood, and by that Means constitute a firm Body, as the Timber of any Tree.

From hence we do not only learn, that in all Plants there is a Necessity of two specifically distinct Juices to act upon one another, but that these in their Action are filter'd or refin'd, alter'd and changed, according to the Parts they pass through; and also, that in some Parts they sooner ripen and become prolifick than in others; they are also more grateful to the Smell in some Parts, than in others: Nor is this all; this mixing, filtering and ripening, sooner or later, of the Juices, gives Difference of Colour to the several Parts of the Plant, and is seemingly the Occasion of most of the Alterations which we find in the several Parts of Trees.

Dr. *Grew* supposes the chief governing Principle in the Juices of Plants to be the *Saline*; which *saline* Principle, he tells us, must be understood as a *Generick* Term, under which divers Species are comprehended. The

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Vegetable Salts seem to be Four, viz. the *Nitrous* and *Acid*, *Alkaline* and a *Marine*; arguing, First, from the *Cuticular* and other *Concretion*, commonly called *Moldyness* or *Mother*, in *Liquors* distil'd from *Herbs*, *Vinegar*, and such like; for in these, says he, there is a *Tendency* to *Vegetation*, and many of them are true *Vegetables*, as *Dr. Hook* has observ'd in his *Micrographia*, and has been confirm'd by others. Now the *Liquors* where these are found, do wholly, or in part, lose their *Taste* and *Smell* and become *Vapid*, the more sensible *Principles* therein having made their *Transit* from the *Fluid* into the concrete *Parts*.

But in a more particular manner my Author observes, the *Nitrous Salts* seem to be assign'd by Nature chiefly for the Growth of *Plants*; the other *Three Salts* are exhibited by the several Ways of resolving the *Principles* of a *Plant*, some in their natural State yield an *Acid Juice*, others by *Fermentation*, and most by *Distillation* in a sand *Furnace*, yield an acid *Liquor*.

By *Calcination*, all *Plants* yield more or less both of a fix'd and *Volatile Alkalous Salt*, the first in the *Ashes*, the latter in the *Soot*; but the *marine Salt* is obtain'd no other way but from a *Solution* of the *Alkaline* upon its being expos'd to the *Air*.

The *Diversity* of *Salts* found in one *Plant* serves not only as a *Proof* of what has been related above, but has given the *Hint* to *Physicians*, of using sometimes one *Part* of a *Plant*, and sometimes another, as the *Case* of their *Patient* requir'd: The *Root* is service-

able on some Accounts, the Bark in others; the Wood in others; the Flowers, Fruit, and the naked Seeds, have all their several distinct Virtues. But because it is not in every ones way to extract the Salts from Plants, as has been related, I shall here insert a Method prescribed to know what Salt is most prevailing in every Plant, but chiefly in their flowering Parts, which perhaps may be worth the Tryal of the Curious, but I have not yet had an Opportunity to try it; for could we once judge rightly of the Quantity of each respective Salt residing in a Plant, we might have a surer Guess at the Manner proper to improve their Vegetation, which is the Point we are now upon.

*Table of Experiments recommended by
Dr. Grew.*

Saccharum Saturni, drop'd on a Tincture of Red Roses, makes a faint pale Green.

Salt of Tartar upon the same, a deeper Green.

Spirit of *Hartsborn*, on the Tincture of Burage and Larkheel Flowers, makes a Verdegris Green.

The same Spirit upon green Leaves does not change them; which seems to intimate, that some Alkaline Salt in the Air, is predominant in the Production of Green in Plants.

Salt of Tartar on white Dasy Flowers, changes them light Green.

Spirit

Spirit of Sulphur on green Leaves of Adonis Flower, Everlasting Pease, Holy-oak, changes them Yellow.

Spirit of Sulphur on the yellow Flower of Crow-foot, alters not. And the Doctor observes, that in Yellows, the *sulphurous Acid* and Alkaline Parts are all more equal; But I rather think they consist chiefly of Sulphur, because Sulphur with Sulphur can produce no Change.

Spirit of Sulphur on Tincture of Clove July Flower makes a bright Blood Red; so that as Alkalies or other analogous Salts are predominant in Greens, so are Acids in Red.

Spirit of Sulphur on Tincture of Violets, turns it from Blew to a true Lake or middle Crimson.

When Sulphur and the Alkaline Salts are more equal, they produce Tawny.

When Sulphur, Acid and Alkaline, Yellow.

When Sulphur predominant, and the Acid and Alkaline equal, to a Blew.

When Sulphur and Acid are predominant to the Alkaline, then Purple.

When Sulphur predominant to the Alkaline, and the Acid to them both, then Scarlet.

When Acid is predominant to the Alkaline, and Sulphur to both, then Blood Red.

To give my Reader some further Hints relating to the Colours observable in Plants, I shall insert the Copy of a Letter which I writ to my learned and ingenious Friend, the late Mr. James Petiver, F. R. S. Anno 1717. which more especially I chuse to do in this Place,

Place, because it relates to some Experiments I have already made, and to some others which I think may be necessary to make, towards finding out the essential Parts of Plants, and may lead us more precisely into the way of improving their Growth.

To Mr. James Petiver, F. R. S.

S I R,

AMong the many Enquiries which have been made (by the Learned) into the mysterious Order of Nature's Works, I have not found any Reason given for the Diversity of Colour in the Leaves and Flowers, &c. of Plants; nor dare I presume to resolve so great a Question, but shall only give some Hints which I believe may be serviceable towards the forwarding this great Discovery.

It will be proper, in the first place, to consider the Nature of Colours in general; and after what manner the several Parts of it are form'd: And, in the next place, we ought to examine the Disposition and Order of the Vessels in Plants. And, lastly, we must consider what Proportions the Vessels of each Plants bear to the Colours produced by them.

And, First, touching Colour in general, we are sensible, it appears in all sorts of Bodies; as, in Flowers, Fruit, Minerals, Clouds, in the Rainbow, in the Shells and Scales of Fishes and Insects, in the Hair of Beasts, and in Plumes of Birds; in a word, there is not any thing that is not of some Colour: It has been customary to give the

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First place to White above all the rest, and the last to Black, as esteeming them to be the two Extremities of Colour; the First represents Light, Joy, Life and Action; and the Other Darkness, Sorrow, Death and Repose.

Aristotle tells us, that Light is the Origine of Colours; and, says he, they have no ways any Relation to the Temperature of Bodies; for Example, White is as well seen in cold as hot Subjects; for Snow is cold and Lime is hot and dry; Milk is Liquid, and Flower or Meal is dry; so that according to his Opinion, Colour does not depend upon the First Qualities, but simply in the Figure and Order of the Parts; from whence, if their Corpusculæ be Spherical, they produce White, and if they be Triangular, they produce Black. We may observe, that White is much brighter, as it is produced by a greater Quantity of Rays, and Black is so much more obscure as at it has less Rays. The Medium Colour between these two Extremes is Red, because it contains as much Force of the one as of the other; for Yellow contains more of the White, and Blew more of the Black. Green is a Compound of Yellow and Blew; for if we lay a Peice of blew Glas upon another piece that is Yellow, and so place them, between the Eye and the Objects, whatever is seen through them, will appear Green; but other Colours do not seem so inclineable to unite as Blew and Yellow; and there is good Reason for it, because the Parts are different in Proportion in all other such like Mixtures; and so long as there is any one Colour predominant, there can be no Union.

Father

Father Nicéron tells us, that Red is produced by an equal Interruption and Continuation of Rays, as if we were to suppose Three continued Rays and Three Points of the Object which were dark. And this Supposition might give us to believe, that all Colours were composed of White and Black, that is to say, of certain Proportions of Light and Darkness, or of a Being. And Nothing Yellow is equally distant from White and Red, as Blew is from Red and Black; but the Difference of these may be better explained by the following Table.

White has	Red composed of equal	Black
100 Rays of Light.	Parts of	Angles or Points of
	White and	Darkness.
	Black or of	
	30 Rays and	
	50 Points.	
Yellow has	Blew has	
75 Rays and	Points and	
25 Points.	25 Rays.	
	Green the	
	Medium of	
	Blew and	
	Yellow.	

Sanctorius makes all Colours to proceed from Shade and Temperancy, and gives us an Experiment to prove, that Black and White are each of them made up of transparent Globes; and those which give us the Black he thinks to be filled with Matter, and those which produce White, to be void and empty.

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The first gives Shade, and the Second containing only Air, gives none ; for Air and such like subtile Bodies make no Refraction.

Supposing all bright Colours to be composed of spherical Particles, then we may reasonably imagine the brightest Sorts of them to consist of smaller Globes than those which are more faint ; because we know, says *Sanctorius*, that in all transparent Bodies of this Form, every single Globe will at least send one Ray to the Eye ; and so the more there are of these Rays, so much the more such Colours come nearer to Light its self, which is more dazling, as these Parts are more subtile and refin'd. And so the darker Colours become more sensibly obscure, as they are composed either of more Triangular Parts ; or that the Parts that compose them tend more towards the last conceivable Point of Magnitude.

I would not be supposed here to fix the Points of those two extreme Colours, White and Black, or as one may term them, Light and Darkness, or to suppose they can extend no farther than the Bounds of our Sight ; for there are many ways to prove they are more extensive and boundless, than the common Sight can discern. And it would be to abridge the Power of Eternity, which by continual Progression in Greatness and Smallness, traces mysterious Vastes better conceiv'd than expressed ; and which, as they move farther from the Limits of our Understanding through the unbounded Space of Eternity, leave our Thoughts in Amaze, and lost in their own presumptuous Searches.

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We may observe, that by Filtration, Colours are changed, for every Filter gives its own Form to the Parts of whatever Body passes through it; so that every Colour, if we allow it to be Material, is alter'd by changing the Figure of those Parts which compos'd it. White-Wine becomes Red in the Veins, and Blood passing through the minute Vessels in the Breasts, becomes White. And again, Red Wine becomes White by Distillation. From whence I conclude, that the Difference of Colour in the several Parts of Plants, is partly, if not altogether, produced from the Alteration of the Parts of the vegetable Juices, by filtering through the Vessels or Tubes of different Frame and Magnitude. We may farther observe, that Heat and Cold are the necessary Results of Light and Darkness, and whose more moderate Points are Yellow and Blew; which together produce Green, which seems to be the most prevailing Colour upon Earth.

It is remarkable, that in the growing of Plants, the same Shoots alter and change their Colours from Time to Time, as the Vessels in those Shoots grow larger: When they are in the smaller State, the Leaves are of a faint Yellow, which in their middle State becomes a bright Green, or sometimes Red; and when these Vessels are enlarged to their full Point of Growth, they are of a dark Green, and so towards the Autumn change to a *Feule mort* Colour, from the ripening of the Juices, from thence to Putrefaction, which resolves it again into Earth its first Principle.

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We may likewise examine, whether Plants which naturally grow in dry Places, and lie exposed to the open Sun, do not yield the brighter Colours, or those of the lighter sort? And whether, on the contrary, such as inhabit the most shady Places, are not commonly much deeper in the Green of their Leaves, and endued with more acid Qualities.

Before I conclude, I cannot help observing to you, that many Colours are prepared by Corrosion of Minerals, as *Lead* made into White, call'd *Seris*; *Iron*, into Yellow, call'd *Crocus Martis*; *Quicksilver* into Red, call'd *Vermillion*; *Brass* into Green, call'd *Verdigris*; *Chalk* into Blew, call'd *Smalt*, &c. Now whether these mineral Bodies so model'd, may not be brought to use in helping such Vegetables as most nearly relate to their several Qualities or Colours, is not altogether unworthy our Enquiry.

I am S I R, &c.

R. BRADLEY.

From such Enquiries as these I have been led to most of the Experiments I have made, concerning the Improvement of Vegetables. I must own indeed, some have miscarried; but to fail often ought not to discourage us in the Search of Knowledge; for though we miss of the desired Success, and for which we make an Experiment, we always discover something even in the Miscarriage, which

improves our Knowledge, and gives us Thoughts which we could never have found without it; just like Conversation, which though it may not happen sometimes to be directly answering our purpose, yet may drop us some Hints, which, perhaps, in greater Things may stand as Chiefs in our Argument. I am the more encouraged to give the foregoing Specimen of a Table of Colours, because, was it to be improved, or something like it divided gradually, and mark'd out to shew the several Proportions and Distinctions of Colour in its Progress from the most intelligible White to the darkest Black; one might, from such a Scale, describe more exactly the Colours of Plants, Animals, or other Bodies subject to Natural History, than has been done hitherto: But I know no one who can so properly undertake such a Work, as that great Master of Colours, Monsieur *le Blonde*, who has, with so much Art and Skill, invented a Way of printing Copies from the best Paintings in that extraordinary manner, that it must be a good Judge who can discover they are not really the Work of an artful Pencil. And what makes this Invention still more wonderful is, that all the Varieties of Colour are express'd by the means of Three only, viz. Yellow, Red and Blew, as I was inform'd by the curious Col. *Guise*, who had the chief Hand in gaining *Britain* the Glory of this surprizing Manufacture. Several Pieces are already done, and may be had at Mr. *Valiant's*, Bookseller in the *Strand*.

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But let us now proceed to Examples which may be more immediately useful to Lovers of Husbandry, and such as at present will be more intelligible to those who have not yet enter'd upon the Philosophical way of managing their Lands, or rather chuse to practise in a trodden Path, than try Experiments.

The following Letter I received from a very curious Gentleman, who has given so useful an Account of the Improvements he has made upon Part of his Estate, that I am persuaded it will be acceptable to the Publick.

To Mr. BRADLEY, &c.

S I R,

April 4 1721.

I Have been now seated about two Years and Half in the West of *England*, where I find more Satisfaction in one Day, than *London* could produce in a Month. I am Possessor of as much Land as might be let to Farm for Two Hundred Pounds *per Annum*; and from the Employment I have in it, I enjoy perfect Health, a plentiful Competency, and the desir'd Sum of every Thing, CONTENT. My Business affords me wholesome Exercise, which makes me Amends for the Time I lost in the Diversions of the Town. My Plenty proceeds partly from the Cheapness of the Country where I live, and partly from a little Art, which I practise, of keeping within my own Jurisdiction those useful Things which will constantly supply my

my Friend with a good Dinner, though the Markets were vacant, and the Encrease I have made in my Plantations ; from such Fountains, you may easily guess the Enjoyments which are continually flowing for my Advantage and Satisfaction.

I am persuaded since you are upon such a Work as *A General Treatise of Husbandry*, some Particulars of my Management, and the Account of the Profits I gain from my Labours, will not be disagreeable to you, and may perhaps contribute to cultivate in the Minds of your Readers the useful Art of improving the Landed Estates.

The first Thing I did when I came down to this Place, was to examine my Stock of Timber, and agreeable to your Directions, to weed out such Trees, as were not capable of improving themselves, either because they were past the Time of their Growth, or had been long kept as Pollards, or hurt in their younger Days: From these I got a good Stock of Firewood, some very useful Timber towards the Repair of my House, and a great Quantity of Paling, which served to enclose a Piece of Ground of fourteen Acres; and as much more, of all sorts, as was sold for almost 30 Pounds; which Sum did not only pay my Expences of cutting down my Wood, and bringing it to the Uses mentioned, but left me, in ready Money, upwards of fourteen Pounds, which I apply'd to the Improvement of the Estate in the following Manner.

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I Bought 100 Young Elms, which had not been trim'd in the Nursery ; their Height about 8 Foot, for	3	00	00
Paid for Carriage from the Nur- sery to my Ground	0	01	00
Paid for digging the Holes, planting and staking them	0	03	00
Paid for trimming 200 Stakes, from the Lop of those Trees I cut down	0	01	04
Paid for two Bushels of large Acorns	0	05	00
Paid for digging 20 Rod of Ground, at 3 <i>d.</i> Rod, and sowing them	0	05	00
Paid for one Bushel of Beech Mast	0	02	06
Paid for two Bushel of Ash Keys	0	04	00
Paid for three Bushel of Quick- set Berries	0	06	00
Paid for digging 20 Rod of Ground, at 3 <i>d.</i> per Rod, and sowing them	0	05	00
Paid for two Bushel of <i>Spanish</i> Hazle Nuts	0	10	00
For Carriage	0	02	08
For digging 10 Rod of Ground, and sowing them, at 3 <i>d.</i> per Rod	0	02	06
For Six Hundred Chestnuts, at 6 <i>d.</i> per Hundred	0	03	00
For Six Hundred Walnuts, at 6 <i>d.</i> per Hundred	0	03	00

For

For two Ounces of Scots Firr	}	0	10	00
Seed	—			
For digging' 12 Rod of Ground,	}	0	03	00
and sowing them, at 3 d. per				
Rod	—			
For 2000 Elm Sets, at 2 s. 6 d.	}	0	05	00
per Thousand	—			
For preparing the Ground, and	}	0	01	08
planting them	—			
I allow for the two Years Rent	}	0	10	00
of the Ground thus employ'd				
The Ground was already en-				
closed ; so that I shall not				
guess at the Price	—			
The whole Amount of this Tim-	}	7	12	08
ber and Wood Plantation is				

The Ground being thus disposed, I must confess I was a little impatient to see how my Nursery would improve.

When I planted my 100 Elms, viz. at the End of *August*, agreeable to an Experiment you try'd at my Brothers, I gave them at least a Barrel of Water to each Tree; so that the Earth they were planted in, was almost like Pap, or a thick Mud, which I remember the late Duke of *Rutland* told me you had advised him to do, in order to settle the Earth close about the Roots of Trees, and to keep the Air from drying the Roots, and which, I find (since) in a Letter from you, has been practised by Mr. *Johnstone*, at *Twittenham*, some Years; but his Method, by what you observe of planting Trees directly in Mud, I conceive to be much better than what I

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learned from you, at first, because by what you relate, I understand that Gentleman makes every Part of the Summer Season subservient to his Art. Pray give me some Account, if possible, in your next, what Success that curious Gentleman has had in his Plantations of this Sort. My *August* Plantation from your Experiment, I find to do very well; but I did not trim my Trees till the following Spring, which I think has given them more Strength of Shoot, than my Brother's, which were lopped before planting.

My Acorns came up in six or eight Weeks after planting; so that the first Year I had several thousand young Oaks about four Inches high, which, according to the Rate of the Nursery Men, were worth then at least 2 s. per Hundred; but to set their Value very moderately to you, who must allow for Chance in Badness of Seed, and Accidents by Vermin, I will only suppose 4000, which may be about Two Thirds of my Number, and then the Value will, in the six Months Growth of young Oaks, from the time of sowing, be 4 l. and the second Year (if there happens to be a Market for them) about 3 Shillings per Hundred, which is 6 l.

The *Beech Mast*, the *Ashen Keys*, and the *Quickset*, appeared above Ground the second Year; some of the *Ashen Keys*, indeed, being old Seeds, as you have observed, came up the first Year; but I have now a large Number of each, which make a good Appearance, and will serve to plant a large Piece of Ground, which I am about to purchase: To reckon only 10 s. per Thousand

for my Beech and Ash Plants, I have enough to bring me 3 *l.* 10 *s.* and my Quickset, which is excellent to plant for Fences, amounts to about 9000 Plants, for which I am offered ten Shillings per Thousand at *Michaelmas* next, so that their amount will then be 4 *l.* 10 *s.* which, with the 3 *l.* 10 *s.* Value of the Beech and Ash is 8 *l.*

Of the Hazle, I have hardly two thousand Plants, which, according to the Rates given for the Slips and Sets of them, in the Gardens about *London*, may very well be worth to me or my Neighbours, two Shillings per Hundred, with less Uncertainty in transplanting, and less Expence of Carriage; so that their Value is about 2 *l.*

Of the Chestnuts and Walnuts, one with the other, I have not above 700 Plants, but they are prosperous; and, I think, may at a moderate Price be valued at 2 *s.* 6 *d.* per Hundred, which makes 17 *s.* 6 *d.*

My Scots Firr Seed came up the first Year; so that I expect they will be near two Foot high this Summer, and then at a moderate Price, as I am told by the Gardeners about me, will be worth fifteen Shillings per Hundred. From the two Ounces of Seed, I have about 800, from whence I suppose above half the Seed was lost, either in the Ground, or devour'd by the Birds, who are very voracious of them; but to defend my Seminaries for the future from the Birds and the Snails, which are very fond of them, while they are in their tender Shoot, I have contriv'd a Frame to enclose each Bed, of Planks pitch'd over, and thickly covered with Glass, beaten moderately

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ately small, so that no Snail or Slug can crawl over them, to get at the young Plants; and Part of an old Net strained over this Frame, keeps the Birds from doing any Damage. My Nursery of Firrs, according to my reckoning, comes to 6 *l.*

Out of the two thousand Elm Sets, I have only come to good, about one thousand, which are now worth 5 *s.* per Hundred at a moderate Price; so they amount to 2 *l.* 10 *s.*

—Allowing my Calculation to be right, the Account stands thus.

	<i>l.</i>	<i>l.</i>	<i>d.</i>
Oaks 4000, at 3 <i>d.</i> per Hun- dred —————	6	00	00
Beech and Ash Plants 7 thousand at 10 <i>s.</i> per Thousand —————	3	10	00
Quickset Plants 9000, at 10 <i>s.</i> per Thousand —————	4	10	00
Hazle Plants 2000, at 2 <i>s.</i> per Hundred —————	2	00	00
Chestnuts and Walnut Plants 700, at 2 <i>s.</i> 6 <i>d.</i> per Hundred —————	0	17	06
Scots Firrs 800, at 15 <i>s.</i> per Hun- dred —————	6	00	00
Elm Plants 1000, at 5 <i>s.</i> per Hundred —————	2	10	00

Value of my Nursery and Se- minary, in its third Year, without reckoning the Hun- dred large Elms —————	35	07	06
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Brought over	—	—	25	07	06
Expence of raising the above					
Plants, as by the former Account			3	18	04
count					
For Care of them in Watering					
&c.			0	10	00
Whole Expence of this Nursery			4	08	04
Clear Profit in Nursery	—	—	20	19	02

But it remains that I give you an Account of the remaining Part of the Money I gain'd by the weeding my Woods, and how I have employ'd it to the Advantage of my Estate; the Sum in ready Money was 14 *l.* of which about 7 *l.* 10 *s.* was expended in the Nursery, so that there remained about 6 *l.* 10 *s.* for other Improvements; but as they are of different Nature from those I have mentioned above, I shall rather chuse to send them some other Time. In the mean while, I should be glad to have your Opinion of a new Plough, which I hear is lately brought from *Italy*, by some *Italians*, who are said to be the Inventers of it. I am told it may be seen near *Buckingham House*.

I am, SIR,

Yours, &c.

W. WALLER.

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We may observe in this Letter a true Spirit for Improvement, which it is to be wish'd may encourage other Gentlemen to increase their Plantations. For considering the State of Timber at this Day with us, how little good there is remaining, and how few have yet regarded the Necessity of making new Plantations, I think the Publick is oblig'd to such Gentlemen as set them such useful Examples, especially when they are render'd so easy, and of so little Expence, as Mr. Waller has mention'd in his Account.

Fifteen Days after the foregoing Letter, I received a second from the same curious Gentleman, Part of which, as far as it relates to Husbandry, I shall insert for my Readers Instruction.

IN my last I promised you some further Account of the Method I took to set my little Estate in order, and first I shall mention the living Creatures I bought in for store.

I bought two Dozen of Chickens of the Kind which has white Feathers and Legs, and which I had heard say carry'd Flesh of a much finer Grain, than the larger Sorts with other colour'd Legs and Feathers. Those cost me four Pence a Piece one with another, and were about the Bigness of those which one may buy of the Farmers, about London, for Sixpence a piece unfed, in all comes to — — —

Of

Of *Geese* I bought ten Cou- } l. s. d.
ples, a little before Harvest, for } 1 00 00
one Shilling apiece.

About the same Time I like- }
wise purchased twenty *Turkeys*, }
which cost me about one Shil- } 1 00 00
ling each; having paid for }
them in Stock Wood, amount- }
ing to one Pound, as it was }
valued

I bought two Dozen of tame }
Ducks, at their *Midsummer* } 0 12 00
Growth, for Six Pence each.

Six Pair of *Pidgeons* of the }
same kind of those sold by the }
famous Pidgeon Merchant at }
Turham Green, near *Brentford*, } 0 12 00
they are of a large sort, and as }
I was told, was first brought }
to *England* from *Italy*; these cost }
2 s. a Pair.

I chose them, rather than to stock my Dove Court with the common wild blew *Pidgeons*, because we may draw young Ones from these tame *Pidgeons*, almost at every Season of the Year, and one of these has more Flesh than three of the blew Sort; and besides, the wild common *Pidgeons* breed but a small Part of the Year, and even they must be, for the most Part, fed at home, if we expect any Advantage from them; so that to compare the Expence and Profit of one and the other, I conclude there are more Advantages arise by keeping the large tame *Pidgeons*, than from the other. Thus it appears that the prime Cost

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Cost of the Poultry I bought in, amounted to three Pounds twelve Shillings, and the Offall of my Farm Yard kept them in good Plight, (except the Pidgeons) till we had occasion to feed some for killing; and then the Pollard wich we fatten'd them with, as it was the Produce of my own Ground, did not stand me in three Pence each Fowl; so that to say the most, a good fat Chicken, which would cost at the Poulterers in *London*, about two Shillings, I could eat at home for about 8 pence Charge.

The early raised Pullets gave me as many Eggs in the Winter, as I used in my Family, and brought me as many Chickens as almost trebled my Number; so that I was either to chuse whether I would sell some, or allow them more Food than the Barn Door or the Waste of the Farm would afford them; but as I had Corn by me at little more than half the Price I must pay for it at Market, I rather chose to give them now and then a little extraordinary Food than part with them, or suffer them to wander out of Bounds to seek for it.

My Ducks and Geese, who had Water enough in the Ponds near my House, got a good Share of their Food from Water-weeds and Insects they found there; and by the help of an adjacent Common, with my *Stubbles*, kept them, as well as my Turkeys, for some time from being over ravenous when they came Home. I had so great an Increase of all these, besides a good Quantity of Eggs, that one Third Part of them were sold in the Markets for upwards of Three Pounds Ten Shil-

Shillings, which was above one Third more than the Value of the extraordinary Food required for feeding the Fowls remaining in Farm, and what one might reckon for the Attendance of the Woman that look'd after them.

But I cannot send you an Account of this Nature without observing, that many may be led into Errors by breeding of Fowls, if they do not first consider, that every Farm which will Lett for Two Hundred Pounds *per Annum*, will not maintain so many Fowls as I have mention'd; and, on the other Hand, some Farms of the same Rent will maintain as many more. To the first, suppose the Lands are Meadow or Pasture, what great Advantage can that bring for the keeping of Poultry? The Barn Door in that Case will be lean, and the Fowls starve, without as much Food bought in, as will eat off the Heads of the Fowls; like what I have observ'd at some private Houses, where they keep a large Number of Poultry, and having no Corn Grounds in their Hands, are forc'd to feed them at an Expence (which though it is but a little at a time) amounts in the Year, to double what the Poultry is worth.

But where such a Farm is chiefly or wholly cultivated for Corn, many more Poultry may be kept upon it than I do in mine; and it would be well, if we could rightly proportion the Number. For selfe we may be Loosers by keeping too few, as much as if we were to over-stock a Farm.

I esteem it the first Part of Husbandry, for a Farmer to consider the Expence of his House,

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House, and keep an exact Account of his Out-goings and his Incomings; and therefore I am more particular in my Letters to you upon this Occasion, believing you will give them to the Publick, if you approve of them; but a little more Time will give me more Experience, and that Experience may give me a greater Opportunity of obliging you.

I have at present about 20 Acres of Cow Pasture, besides Common, and the Advantage of some Turneps for Winter Food; by this Means I maintain Nine Cows, but find I might add Two more to my Number. The Cows, however, which I have at present, give me each of them about Three Gallons a Day at least, which together yields 27 Gallons *per Diem*, but sometimes give me 40 Gallons in a Day, from whence I have a large Quantity of Whey and Base Milk to assist the Feeding of Twelve Swine, Two of which are Breeders. In my choice of these, I rather prefer'd the black *Bantham* Breed, than the large sort common in *England*, though I do not believe this black sort eats less than the common large Kind, nor perhaps do they yield so much profitable Flesh for Market by one Fourth Part, as the others; however it is certain, that their Flesh is much more delicate for the Table than the common *English* Breed; whether as sucking Pigs, or in Pork or Bacon. Again, I should remark, that for the better feeding of these Creatures, I have a considerable Help from Brewing my own Drink, from some Offals of my Farm Yard, and the Mast of the Woods. But I shall be particular in another Letter, if

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you

you desire it, and give you my stated Account of Advantage by Milk, Cream, Butter, Cheese, Calves, Piggs, Pork and Bacon; and shew you at the same time, how to judge of the Expence in keeping these Creatures upon a Farm, order'd as mine is. To which I can add, if you are not already apprized of it, the Method of feeding and curing Bacon, as the Farmers practise in *Hampshire*, which County exceeds most, if not all others in *England*, for Flesh of that Kind.

'Tis to be observ'd, that in feeding Cows we must not let them range in too large a Piece of Ground at one Time; I have therefore divided my Twenty Acres into Three Parcels, which I turn my Cows into from one to another, as I see Occasion; commonly I allow them Eight or Ten Days in one, before I change them to another, for else they would trample down and spoil a Third Part as much Grass as they eat. By this changing of Place, and the Liberty I have of some Common and Waste Ground, they have an hearty Feed and pay me well for it: For if we were to enquire no farther than the common Expence of Feeding these Cows by the Week, which to hire Land would be One Shilling and Six Pence *per* Week for each, the Charge of Feeding my Nine Cows will be Thirteen Shillings and Six-pence each Week; and the Calves pay the Interest of the Money I first laid out in their Purchase, and in great Part make amends for the Time lost in the Cows growing dry. Now allowing that I have from these Cows only Twenty Seven Gallons of Milk in a Day, which is a

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mean Quantity, (for some Cows will yield singly upwards of Three Gallons at a Meal;) then the Value of my Milk, was it to be sold for one Penny *per* Quart, would amount in a Day to the Sum of Seven Shillings and Four Pence; and in Seven Days or one Week, to Two Pounds Eleven Shillings and Four Pence; from which Sum, if we take out the Thirteen Shillings and Six Pence for their Week's Grazing, there will remain, neat Money, One Pound Seventeen Shillings and Ten Pence, without farther Trouble than bare Milking: But the managing this Milk in the Dairy, makes it worth more than double the Sum, as I can prove by my farming Accounts. However at present, only take a View of the plain Profit of Milk from Nine Cows, at the aforesaid Rate, for One Year, and you may partly guess at the Advantage you may reap from them: Supposing the Food of a single Cow, throughout the whole Year, comes to One Shilling and Six Pence *per* Week, and that one Day with another, for Twelve Months, a Cow will give Six Quarts *per* Meal, *i. e.* Three Gallons *per Diem*, as I have before related; then we find the Milk of nine Cows to be worth One Hundred Thirty Three Pounds Nine Shillings and Four Pence *per Annum*: But taking from that Sum the Charge of Feeding the said Number of Cows for that Time, which comes to Thirty Five Pounds Two Shillings, there remains clear Profit, Ninety Eight Pounds Seven Shillings and Four Pence *per Annum*; and if we deduct from thence the Price of the Nine Cows, which was about Fifty Pounds, there yet remains

mains the Advantage of Forty Eight Pounds Seven Shillings and Four Pence ; which is very good Interest for Money laid out in Cattle, and their Year's Food paid for: But when I come to mention all the Advantages I make of them, you will find my Profits more than Double what I have related.

I have seen some of the *China* Geese, which I find answer your Character of them, viz. that they are larger than the common sort in *England*, and breed earlier ; but I find the Young ones are very tender, and are both difficult to hatch and to breed up ; therefore I content my self with our common Kind, which seldom bring me at a Setting fewer than Ten, Eleven, or a Dozen a-piece. I am not yet fallen into the way of pulling their Feathers, as they do every Year in *Lincolnshire* and other Fenny Countries.

In the breeding of Turkeys I have found some difficulty, till I took the Advice of the Woman who looks after my Poultry, who by keeping the young Ones with the Hen in a Barn or Out House, till they are about Six Weeks old, preserves them in good Health and thriving Condition. She tells me, that it is not only necessary to keep them warm for that Time, but likewise to keep them from eating small Snails and Slugs, which they would find Abroad, and would scower them to Death. After Six Weeks she brings them out with the Hen, and places them where the Sun is moderately warm, so enclosed in an open Case of Wicker, as to prevent their ranging, and feeds them as she did from the Beginning, with Curds, in which

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is a little Rhew cut small, and some Ant Eggs, but puts them again into the House as soon as they have enjoy'd the warm Air for Two Hours; allowing them, from Time to Time, as they grow more hardy, so much more Time abroad, till at length they become capable of shifting for themselves. But I must not omit to tell you, that in a little time after they are hatch'd, they should have a fresh Turf of short Grass every Day, but without Snails or Sluggs upon it, for the Reason before mention'd.

The Reason of this Letter to you, is chiefly to put you in mind, that Husbandry does not only depend upon the Methods of cultivating Land for Corn or Hay, for that is the least part of a Farmer's Business; I therefore hope from Time to Time, you will give us such proper Directions as you have experienced or can discover, concerning these Things, and shall not fail on my side to send you whatever I can gather from our Country People. I am, S I R,

Your Humble Servant,

W. WALLER.

From this Letter my Correspondents may judge, how necessary it is to make Calculations of this kind, lest a Farm be over or understock'd; but I hope the comparing this with other Accounts of the like Nature, which I may receive, will bring us to a right Understanding of the certain Number of living Creatures, and of what Kinds every distinct sort of Farm should be stored with. But to return to examine the first of these Letters, as it

it relates to Timber Plantations; it may, in some measure, lead us to think of those great Wastes the Forrests, which are not better stored with Timber than the more private Lands, but are for the most part incumber'd with unthriving Shrubs, Pollards and Brushwood, which will never improve, but might be in part cut down, and return Money enough to be employ'd in making new Plantations: And from what one may observe in riding through these extensive Tracts of Grounds, one may readily learn, that the few Trees which are now growing there, are too often in danger of being destroy'd by the Commoners, who (if I guess right) believe they cannot be miss'd, because they do not stand in regular Plantations. It is, however, necessary, if the Forrests should be put in order after this manner, and regular Plantations made from the Monies raised by weeding the decay'd Woods, that there should be due care taken to preserve a sufficient Quantity of the Brush or Underwood for the Shelter and Brouze of the Deer and other Cattle, and that no thriving Timber Tree should be lopp'd. The following Letter which I receiv'd some time ago from Sir Henry Goodricke, Bart. may prove very beneficial to Lovers of Planting; some Gentlemen to whom I have communicated it, having already found their Advantage, by following the Method prescrib'd in it.

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To Mr. BRADLEY, &c.

S I R,

I Having lived in and about *London* at the Age, when Youth usually chuse their Pleasures, and those of that Place being very different from what are called Country Sports, I became not at all inclineable to join in the Diversions of my Neighbours, when I came to live in the Country, as having no Taste of their Pleasures, so fell into those of Planting and Gardening, which seemed most suitable to my always desired Retirement in the Country, where I have been settled about Ten Years ; and to assist me in the Prosecution of my Planting, there has (I believe) no Book come out relating to the Subjects of Gardening, Planting or Husbandry, that I have not procured ; and amongst the rest, one lately published by your self, (intituled, *New Improvements of Planting and Gardening, both Philosophical and Practical*) in the Conclusion of which you encourage all your Readers to communicate any Observations they have made, which must be my Excuse for giving you the Trouble of this Letter. If what I have observed be acceptable to you, or the least useful to my Brother Planters or the Publick, I have my End ; if 'tis not, or they chance to be Observations made by others more experienced, then you have, Sir, only the Trouble of reading this, for which I ask Pardon, as also for acquainting you with one Mistake some way slipped into your Book, in the 65th
Page

Page and Sixth Line, where you say, that Acorns and Ashen-Keys, will come up the first Year: Acorns indeed always do, if they come up at all; but then Ashen-keys are as sure to lie two Winters and one whole Summer in the Ground, as any Seed whatever.

As to my Observations of what I think may be useful, I find the Expence of Planting one great Discouragement to it, and the Weeding of young Plants (seedling Oaks especially) to occasion the greatest part of the Expence; and I found by Experience, that if the Plantation exceeded the Extent of a Grove, the Trouble of Weeding was endless, and the Charge discouraging; and yet all Treatises about Planting, made that Weeding to be absolutely necessary: However, I resolved between Three and Four Years ago, to try an Experiment, and sowed several Acres of Ground with Acorns, keeping it fenced. I took no farther notice of it, but let the Weeds grow and fall as Nature guided 'em, and now have ordered about a Yard or Two Square of that Ground to be cleared of Weeds and Grass, and find my young Oaks there thriving and healthy under the tall Weeds, and likely to become a Wood in a few Years, and doubt not but when they raise their Heads above the Weeds, they'll soon shoot away prodigiously; for though they might have grown something faster, if weeded, yet the Roots may have been strengthening themselves under-ground all the while, and Weeds and Grass may have sheltered them from many external Injuries such small Plants are subject to, as Frosts, Droughts, the Crop-

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ing of Hares, &c. And the rotting of the Weeds yearly upon the Ground, must enrich the Land against the increasing Bulk of the Trees requires more Nourishment; whereas, the carrying off of those Weeds must certainly impoverish the Soil, tho' the present weeding and stirring the Soil may force the Nutritious Juices into the young Plants, and thereby give 'em a more speedy Increment now; but hereafter when they will require more Nourishment, they are not only deprived of what they formerly had, but the Soil being impoverished by the continual carrying off of what it produced annually, the Trees remaining may grow mossy, stunted, and hungered, and consequently never make good Timber. If this Method of Sowing, without further Charge than only that of fencing, be approved, then his Majesty's Forrests (now Deserts) may be replenished with Wood at much less Expence than I think has been proposed hitherto; and 'twill be great Encouragement to all large Plantations, which the Charge of Weeding has hitherto confined in a narrow Compass. I must indeed own, that all small Trees transplanted must be weeded, or they'll be choaked by those Weeds, which Nature makes a shelter to the Seedlings; therefore Plantations of that kind, of Elm that does not bear Seed, and all Trees raised of Sets transplanted, must be weeded.

Another Observation I must mention, that where any Falls of Timber have been made, and according to the Direction of our Planting Books (nay, even of our Laws) several young Trees have been left standing, that

they have soon after been starved with the unusual Access of the cold Winds, and come to nothing; whereas, where the Fall has been general, the young Trees so cut amongst their Seniors have from their Roots made strong Shoots, from their first Advance out of the Earth accustomed to the Cold, and continuing their Growth with the Shelter of what sprang from the Roots of some older Trees, have come (as I am informed by experienced Men) to grow up to good Timber. This also appears plainly in all Plantations, that where the Trees are set or sown at the distance they are designed to be at when come to Perfection, that such Trees spread their Branches, grow crooked, and never grow to tall or strait Timber; and that where they are thick planted, there is an Emulation as it were among 'em, which shou'd outstrip each other; and when some have got the start, they soon take the Nourishment from their less thriving Neighbours, which less thriving are the properest to be removed, (before they grow quite stunted) to some New Plantation, and being cut down like Quickset will go near to thrive well.

I shou'd also recommend the Sowing of all Mast when Nature directs, (especially Acorns in *October*) viz. as soon as they are ripe, for those I sowed in that Season did very well, and those for the most part failed which I reserved till *February*, the Month directed for Sowing them; the Reasons I suppose to be as follows, that *October* is a Month for Sowing Hard-corn or Winter-corn, and then the Mice, Rooks, &c. are busy in storing them.

themselves with Corn either yet left scattered or new sown, and will not be so greedy after the Acorns; and the Acorns reserved till *February* will spire by that time do what you can, so must be sown, and that Month being too early for the Spring Seed-time of Corn, the Rooks and Mice, &c. especially the Rooks, are so pinched for want of other Food, that they will dig over all the Ground new sown with the Acorns, and destroy great part of 'em, and meddle not with those sown in *October*, the new breaking of the Ground being the natural Direction for them where to seek their Food.

I own, Sir, I expect with impatience your promised Treatise of the *Parterre* and *Flower-garden*, since so Ingenious and Curious a Pen must make that Subject diverting and useful, who have in this former Treatise handled the new Philosophical Doctrine of the Generation of Plants with so much Argument, that 'tis convincing, tho' at first sight. I confess my self not skilled in Flowers, leaving their Culture (tho' I love 'em) to my Gardener, whilst I imploy my self in my Park and more distant Plantations: But if I am blessed with Continuance of Life so long as to see my long-lived Plants in some tolerable Perfection, I may then chance to amuse my self in my *Parterre*, where I may meet with Pleasures less fatiguing to the Infirmities, which Advance of Years brings on us all. I once more ask Pardon for this Trouble; but be assured, that as 'tis the first Letter I have written to a Stranger on this Subject, so I wou'd not have writ it now, had I not relied upon

the Candour of an Author, whose good Sense and Speculation will make Improvements from the Hints of those who have but slight Experience, and amongst such, Sir, of your unknown humble Servant,

H. GOODRICKE.

*Ribstan near Borough bridge
in Yorkshire, January 29.
1716-17.*

P. S. I have made, and am still making, several little Experiments in Planting, Gardening and Husbandry, which I forbear to mention, believing the Curiosity of others more experienced may have led 'em to make the same, tho' they have not come to my Knowledge at this distance from London, where the Curious all communicate.

IN Answer to the Ingenious Author of this Letter, I have already hinted in my *Kalender*, at the reason that induced me to suppose the Ashen Keys came up the first Year, *i. e.* that those Seeds which are two Years old of Ash, will frequently, if not always, do it: But I am sensible that the Ashen Keys fresh ripen'd will lie two Years in the Ground, as Sir Henry Goodricke affirms.

To follow the Dictates of Nature, in the putting of some Seeds into the Ground, is certainly the reasonable way, and undoubtedly may be a means of preserving them from the Rooks or other voracious Birds. But his Grace the late Duke of Rutland, to whom I read

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read this Letter, told me, that the Seminaries which he made in Autumn, had suffer'd extremely by the Mice, Squirrels, and such like Vermin; so that he imagin'd he had lost above half the Seed that was Sown; so that 'tis almost unavoidable but some must be destroy'd. But I think the surest way of preserving those which lie two Years in the Ground, would be to sow them with some Corn or Grain, which will pay more than the Expence of the Seminary five times over; and the Corn is of so different a Make and Structure in its parts from the Trees we sow with it, that it does not any way rob the Ground of the Nourishment which such Trees will require: And I am fully perswaded, as well from what the aforesaid Worthy Gentleman relates concerning his Nursery of Oaks, as from the Experience I have had since I received his curious Letter, that Grass and Weeds rather contribute to the Preservation of young Seedling Trees, than do them any harm; and therefore, as he justly observes, that Expence of Weeding is unnecessary, especially among those Trees which are tap-rooted, as Oaks, &c. The Postscript of the Letter gives me hopes that the Gentleman who wrote it will yet be so kind to the Publick, as to continue his ingenious Experiments, and give the World an Opportunity of improving by them.

But let us now enter upon a few Remarks and Experiments relating to the Improvement of some Soils and Grains, as they have been practis'd by several Ingenious and Learned Men.

Dr.

Dr. *Bury* of *Compton* in *Devonshire* tells us in a Letter, that the burning of the Surface, which is so much practis'd in his Country, is only used in bad Lands, and by worse Husbands; for it robs the Ground, which he tells us, is not only an Observation of his, but also of His Grace the Arch-bishop of *Dublin*. If by bad Lands these Great Men understand the Moory or Heath Grounds, I cannot see what well can be done with the Turf or Peat (which is the Heathy Turf) unless it be burnt upon the Ground: For tho' this is used for Firing by some poor People, yet when there is any large Quantity of such Land turn'd up, there will be more Turf or Peat than can well be carry'd away. And again, as this Turf chiefly consists of Roots and other parts of Vegetables, there must be in it many vegetable Salts, which after 'tis burnt, will be fix'd; tho' indeed we may say they are only the Salts of such Herbs and Plants as we seek to destroy, and are not proper for the Crop or Grain they ought to nourish. But as we have observ'd before, that by Solution, and exposing to the Air, these Alkaline Salts will yield the Marine Salt; so the letting these Ashes lie for a while exposed to the Rain, Snow and Air, will bring them to that State, as Experience and Dr. *Bury* in his Letter esteems to be proper for the Improvement of Decay'd or Infertile Land.

The Doctor tells us, Salt quickens dead Land, and is used in the South-west part of *Devonshire*, which would else be the barrenest, but is now the richest part of it: The People in that part of the Country get Sand as far as
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the Sea will permit at the lowest Ebb, and do not grudge to carry it upon Horses Backs 14 Miles to spread on their Land, and thereby improve it both for Corn and Grass; in other parts of the same Country they mend their Barren Land with Lime.

He adds, that some suppose that crude and single Salt, if strew'd on the Ground, does not improve, but corrode it, but Lime betters it; but in this they agree, that they produce not Grass fit for the Scythe, but for Pasture, short and sweet, and growing all the Winter, nor are their highest Grounds parched in the hottest Summer. This is matter of Fact, and known to every Ploughman. It is further related, that by the Coupling of these Male and Female Salts, the Country would be much improv'd; if the Sea Salt is too lusty and active of it self, the Lime has a more balsamick and gentle Salt, which being directly join'd with the other is thereby invigorated.

Glauber gives us a Lesson upon this Occasion, not unworthy our notice: Take, says he, Quick-lime, and let it slack by time without Water; then take Salt and Water, mix them together, and make them into Balls, dry them as you do Bricks, and burn them two Hours; he tells us this Compost will enrich your poorest Land.

Doctor *Bury* is so far perswaded of the good Effect of Salt and Lime, that in the Conclusion of his Letter, he wishes the Duty were taken from Sea Salt, that it might be more generally used for the Improvement of Land. And truly, I cannot help joyning with him in his Thought; for as he observes, Grass Grounds
are

are much improv'd by common Salt; and such things as abound with Marine Salts, are greatly helpful to those Lands which are design'd for any of the Gramineous or Grassy Tribe. 'Tis a common practice in many Places near the Sea, to manure their Grounds for Corn with Sea Weeds, but they must be Plough'd in pretty deep, and as soon (if possible) as they are brought upon the Land; nor is the Brine or Lye for the Grain less to be regarded by some People, than the Manures for the Land 'tis to be Sown in, therefore I shall give the following Examples.

Mr. *de la Prime* has given us an Account of some Experiments relating to the Steeping of Pease, Wheat, Barly and Oats, which are recorded in the *Philosophical Transactions*, and may serve to lead the Curious how to judge of Brines for steeping of Seeds.

On the 22^d of *March* he steep't

A Pea, Barly, and Wheat in Brimstone Water.

The same kind in Allom Water.

Ditto, in old Dissol. of Sal. Tartar.

Ditto, in Cap. Mort. of Sal. Arm. dissolved in Urine.

Ditto, in the Dissol. of Salt of Walls.

The same in the Dissol. of Niter.

Ditto, in Urine.

After steeping them 5 Days and a Night, he set them in a good Garden Soil, against a Wall full exposed to the Sun, on the 27th of the same Month, after a Rainy Night, with a Pea, Wheat, Barly and Oat unsteep't.

On the 10th of *April*, the Pea, Barly and Wheat steep'd in Brimstone Water all were up together.

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The Pea in Allom Water swell'd, but not sprouted, but the others steep'd in the same above Ground.

The Pea in Solut. of Sal. Tart. half come up, the Wheat scarce sprouted, but the Barly and Oat quite up.

The Grains steep'd in Cap. Mort. of Sal Armoniac dissolved in Urine were all up together, as also the others that were steep'd in Solution of Salt of Walls.

The Pea and Wheat in the Dissolution of Niter were about half up, the Barly and Oat quite up.

The Barly and Oat steep'd in Urine were come up, but the Pea and Wheat scarce sprouted.

From whence this Gentleman observes, that Allom Water is not agreeable to the Nature of Pease and retards their Growth, because the Pea unsteep'd was up as soon as any of the other Grains; and that Salt of Tartar is not friendly to Pease or Wheat, but is concordant to the Nature of Oats and Barly.

He farther observes, that the Wheat, Barly and Oat not unsteep'd were up as soon as any of the rest; so that he concludes such Brines as he used, rather retarded some of the Grains steep'd in them in point of quickness of Growth, than brought them forward: But then he remarks, that three Spires of the Barly which he left to grow at a Foot and Half or Two Foot distance, increased so exceedingly, that one had Sixty, another Sixty five, and the other Sixty seven Stalks apiece from their single Grain or Root, with every one an Ear on, and about Forty or more Grains apiece in them.

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Digby

Digby mentions a Plant of Barly, that by steeping first the Grain in Salt-peter dissol. in Water, and keeping the Plant water'd with the same kind of mixture, brought forth 249 Stalks and above 18000 Grains; and *Cambden* mentions, that the Corn sown in a Field in *Cornwal* after a great Battle, brought forth 4 or 5 Ears on every Stalk, if he was not imposed upon. I am apt to suppose that the Richness of the Ground he speaks of, proceeded from the Human Blood that was spilt in the Battle, for it is certain all Animal Bodies and their Apper tinances are great Helps to Vegetation, as I have partly explain'd in some of my former Works, but shall treat of more fully when some of the Experiments are resolved, which I have now under Tryal.

The following Advice concerning the Management of some old Vines, which had been neglected for some Years, I sent about *Michaelmas* in the Year 1719, to a Gentleman who had then purchas'd the Estate where they grew, and disposed himself to put his Gardens in Order before he began to repair the Mansion House.

S I R,

AS there is nothing more desirable than gaining or saving of Time to a Gentleman who is a Lover of Planting, my design in the following Directions is to put you into immediate Possession of Good Fruit; tho' I must confess, after Wall-trees have been in a manner lawless for two or three Years, and have run at random without controule, 'tis hard to bring them again to the good Dispositions they enjoy'd

joy'd whilst they were regulated by judicious Government; and the Vine especially, which is a Plant that above all others is most enclining to ramble out of Rule if it be suffer'd to take its own Course, requires the Skill of the Gardener more than other Trees, to bring it into healthful Order; and in this our dressing and ordering it must be agreeable, partly to the Rules of Art, and partly to the Laws of its own Nature, for without both these Considerations we shall never bring it to that good Order we desire.

We must know, first, that all Vines bring their Grapes upon Shoots of the same Year, and those Shoots as well as the Grapes they produce, are much fairer and better furnish'd, as they sprout from large Shoots of the former; for those which spring from the old black Wood are faint and weak, affording only small Bunches of Grapes, that ripen later as they are more remote from the Earth: Therefore 'tis practis'd by the best Artists, to keep their Vines low, and lay the Branches for bearing as near the Ground as possible, by which means the Fruit is larger, and ripens much sooner; but especially, if we bury part of them in the Earth, so as they may take Root, for then they are doubly nourish'd, *viz.* from the Root of the Mother Plant, and from the Fibres which strike out of the Layers; and we may yet help these young Shoots in their Growth, by laying little Balls of soft Soap for the Roots to strike into.

In the Case now before us, the Vines may be brought into Method two Ways; first, we must disengage them from the Walls, and dismem-

ber them of all the smaller Shoots, leaving only such of the new ones as are as thick as ones little Finger, or the largest we can find of the same Year; which if they are strong Shoots, we may prune to a Yard or more in Length, or leave them shorter in Proportion as they are less vigorous. When the Vine is thus order'd, dig up the Ground about it, and bend down the whole Vine as near the Earth as possible, making it fast with strong Hooks or Stakes, so that the Spring of the Body of the Vine may be curb'd in such a manner, that it shall not at any time stir the young Layers, or draw them out of the Earth; for every Shoot after it has been prun'd as above directed, must be lay'd in the Ground two or three Joints at least, and the Parts of them which rise out of the Ground for bearing, be ty'd up to Stakes of four Foot long; for tho' perhaps when you lay them down in *November*, they may not appear longer than a Foot above Ground, yet we must provide to tye up the young Shoots which will sprout from them the following Summer, so shall we have a little Vineyard in one Year bearing Fruit, made out of one single Plant, if it be large and well furnish'd with Branches. And when the Fruit is ripe, we may cut the Layers from the old Vine, and place its Stem or Body with the strong Shoots it has made that Summer against the Wall we took it from. In the time when we first lay down this Vine in the Earth, we may contrive to place a Layer or two near the Wall, so that they may remain there; and I think it would be well enough worth while to provide Pots for the other Layers to be drawn through, rather than lay them

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in the naked Earth, because when they had ripen'd their first Fruit, we might remove them where we pleased, without hazard or any loss of time.

The second Way I would prescribe for the improving such old unruly Vines, tho' they were grown very high, should be to prune them as I have before directed; and where there happens to be proper Shoots for bearing at some distance from the Earth, they should be drawn through Garden Pots fasten'd to the Wall in Iron Rings, and fill'd with Earth, which will hasten the ripening of the Fruit, and enlarge the Bunches, as well as if they were to grow near the Ground, and in effect nourish the whole Tree; for every part of it would partake of the Nourishment drawn from the Earth in the Pots, by the Roots of those Branches growing in them: But to assist the rooting of these Branches they must be now and then refresh'd with Water when the Season is dry.

If we order a Vine in this manner, we are sure of as many Plants as there are Pots. If we separate them from the old Stock, or if we let them remain on the old Vine, they may well enough last three Years feeding on their Pot Roots, and the Mother Root; but we should in the mean while encourage no other Shoots of the old Tree, but what sprout from the rooted Parts in the Pots, unless we design to make fresh Pottings to supply the place of the first that are to be taken away.

To conclude: This I recommend as a Tryal, the grafting of one Sort of Vine upon another; which in my Judgment may be done two ways, but both of them must be done upon the green
tender

tender Shoots about the Middle time of their Growth, and the Cions must be of the same Growth and Tenderneſs; the first done in the common ways of Grafting, either to cut the Cion like a Wedge for the Cleft, or to ſlope the one ſide of the Stock Shoot, and ſit the Cion to it with a Tongue; theſe I would have bound together with Worſted as tight as poſſible, without bruſing either the Stock or Cion; and then with a mixture of Tallow Bees Wax and Turpentine, equal parts melted together, be thinly cover'd over with a large painting Pencil when the mixture is not over hot.

The ſecond Way is to Innarch the tender Shoots of one into another, binding them and plaſtering or anointing them as above; and this I think is much the ſurer way, and may be eaſily accompliſh'd, if we have any Vines rooted in Pots, as I have directed. If this way ſucceeds, beſides the pleaſure of ſeeing ſeveral ſorts of Grapes upon one Vine, we may propagate any ſort of Vine we like beſt, with the greateſt eaſe, and I believe, bring them to bear very ſoon. This Grafting I think will do beſt in *June*.

But I muſt now draw towards the Concluſion of this Month's Remarks, and as I promis'd in the former Month, to give ſome Account of the Weather, and what the *London* Markets have afforded us.

This Month follow'd the ſame Mode of Weather which we had in the foregoing Month, till about the Twentieth Day, viz. Exceſſive Rains and Froſts, which laſt very much contributed to the Deſtruction of the Fruit in the Low Grounds in *Middleſex*, and
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some Parts of *Surry*; but what is remarkable, most of the Gardens in the *Uplands* were safe: So that I suppose the Harm which came to the Fruits in the *Bottoms* was occasion'd from cold Dews, rather than any ill Consequences arising from the East Winds, which reign'd at that time, but were not very turbulent.

The excessive Rains, however, were not disadvantageous to the Grass Grounds; for as the Weather from the Twentieth to the End of the Month has been clear and hot, there is a fair prospect of a rich Crop of Hay.

The Violence of the Weather at the Beginning of the Month was so severe, that I was inform'd by the Gardeners about the *Neat-houses*, that they could not cut one Fourth part of the Asparagus which they had done, even in the preceeding Month, which tho' bad enough, had afforded good Crops; the Hot-bed Cucumbers were in some places destroy'd, which gave the few that were brought to Market as great a Price as when they first came in.

May Dukes, and common *May Cherries*, in the last Week were sold dearer by one third than usual, as I learn'd from a great Dealer in those things.

Collyflowers of the right sort were sold in the Gardens for 5*s.* each, but some of the green kind for 12*d.* about the Middle of the Month. Mr. *Jewel* of the *Neat-houses*, sent the fine sort to Market first, about the 14th, and then Kidney Beans raised in Hot-beds were about 3*s.* or 4*s.* per Hundred; he told me he was the first Gardener in *England* that raised

raised the young Sallad Herbs for the Winter Markets, and Kidney Beans in Hot-beds.

Green Goosberries first came to the Markets about the Beginning at 2 s. *per* Quart, and now at the End are sold for Three-half-pence *per* Quart.

Forward Pease were sold this Month for Half a Guinea *per* Pottle-basket, and Beans at 4 s. about the End of the Month.

I choose to mention the Prices of these Curiosities, that we may the better judge of their Scarcity, and compare them with Fruits of the same kind another Season.

We may this and the next Month set the young Shoots of Vines; after Soaping the Ends which are to be interr'd, and keeping them well water'd, they will presently take Root.

I conclude, with repeating the Request I have formerly made to the Curious, that they would continue to oblige me with their Observations in Husbandry and Gardening, directed for me at the Publishers of this Treatise.



The End of the Month of MAY.

A GENERAL
T R E A T I S E
O F

Husbandry and Gardening,

For the Month of *June.*

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improvement of Land.

WITH

An Account of such extraordinary Inventions, and natural Productions, as may help the Ingenious in their Studies, and promote universal Learning.

*To be continu'd Monthly, with Variety of
curious CUTTS.*

By R. BRADLEY, *Fellow of the
Royal Society.*

L O N D O N:

Printed for J. PEELE, at Locke's Head, in
Pater-Noster-Row.

(Price One Shilling.)

A GENERAL

TESTIMONY



Given by the Members of the House of Commons

For the Month of June

CONTAINING

Such Of the Debates and Proceedings as
are Now and Formerly the Property
of the House

WITH

An Account of the Proceedings of the
Committee of the House of Commons
on the Petition of the
West India Planters and Merchants

To be printed by

W. B. E. & Co. Stationers

Printed by

W. B. E. & Co. Stationers

To the Honourable
Sir John Anstruther, Bart.

THIS
T R E A T I S E
O F

Husbandry and Gardening,

For the Month of *June,*

Is with the greatest Respect,

Most humbly inscrib'd
and dedicated, by

His most Obliged

Humble Servant to Command,

R. Bradley.

To the Honorable
Sir John Ashmole, Bart.

THIS
TREASURY



Humble and Grateful

For the Month of June

Is with the greatest Respect

Most humbly intreated
and dedicated, by

His most Obedient

Humble Servant & Scholar

R. Bradley



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A GENERAL
TREATISE
OF
Husbandry and Gardening.



THE Heat of the Weather; which we commonly expect at this Season, gives me Occasion to introduce my Papers for this Month, with some Thoughts concerning the Building of cool Rooms for our Recreation in Summer; which, I think, can be no less agreeable now, than the Inventions for warming Rooms are in the Winter: For as in the colder Months, nothing is more generally agreeable than warm Cloaths and good Fires; so when the

the Sun is in its full Force, there is nothing more refreshing, or affords more Pleasure to Mankind, than cool Breezes, whether Natural or Artificial; which, provided they are moderate and constant, will invigorate the Spirits, and help the Health of the Body. Many of the Curious, have already endeavour'd to purchase the pleasing Coolness I speak of, either in Grotto's or Pleasure-houses, placed in the middle of Woods, but have, in my Opinion, fallen short of their Aim, for want of taking proper Measures to keep out the Sun's Rays, or the Air, which is heated by them; either of which is equally capable of warming whatever Place they enter; and were we to keep such a Place as we design for a cool Room, wholly debarr'd from Air, we should then have greater Cause of Complaint. Some have yet been indiscreet enough to plant their Summer-houses on the Borders of great Lakes and Pools, believing that Water, however it is stagnate, or still, will cool the Air; but in this, Experience shews the contrary; the Pool or Lake, like Looking-Glass, adds to the Heat of the Sun's Rays, which shine upon it, and the Water thus warm'd, must necessarily emit a Quantity of warm Vapours, proportionable to the Surface of the Pond or Lake, which, besides the unwholesome Qualities which all Vapours contain, that rise from standing Waters, the Air is thickned, and becomes heavy enough to damp or dull the Spirits, wanting those nourishing Parts which are necessary to feed the Human Frame, and

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and maintain the Vital Heat: The Experiment Dr. *Desaguliers* made some time ago at the Royal Society, in order to prove that an human Body is nourish'd from the same Qualities in the Air, that are necessary to maintain Fire, may in part explain what I have said.

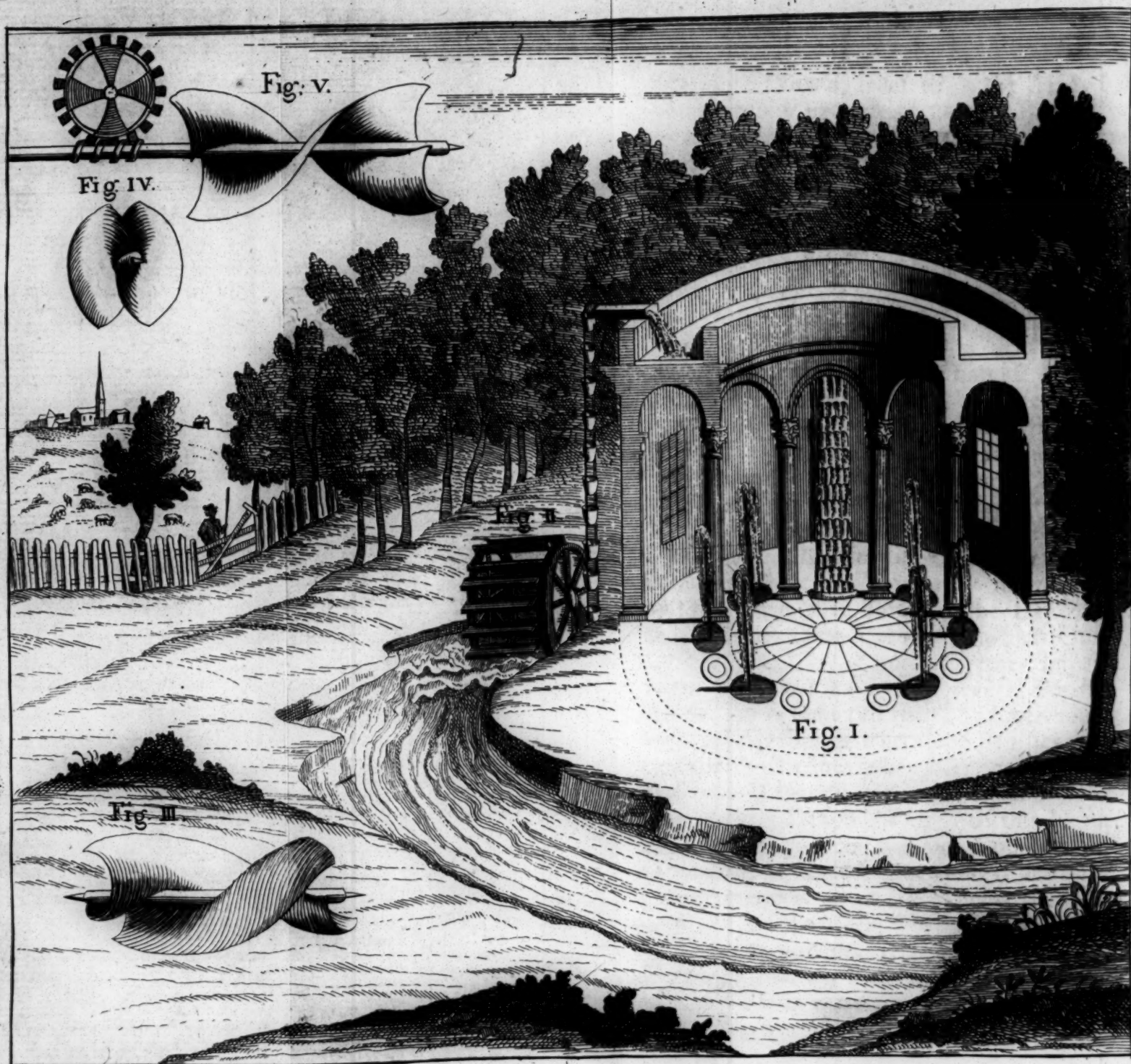
But where there is the Pleasure of a River, there is also the continual Advantage of a flowing and circulating Air; the purling or rousing of the Stream fanns the Air about it more or less, as its Motion is quicker or slower: So that an Alcove or Pleasure-house, placed near a brisk Stream, must be cool and healthful in the hottest Season, altho' it is encompass'd with Wood; for Woods of themselves, tho' the common Opinion is otherwise, rather promote Heat than propagate cool Air; for there is always a Vapour rising among Trees in a hot Day, which thickens and deadens the Air as much as the Vapour which the Sun exhales from the standing Pools, or such Waters as are subject to stagnate. It will, however, be objected, that Woods must be cool from the fanning of the Leaves, and thereby cause a brisker Motion of the Air, than the Currency of a River can do; but this, in my Opinion, is easily answer'd. In the first Place, the Leaves of Trees growing in a Wood, are never in Motion, but when there is a sufficient Air abroad to move them, and then it is natural to suppose, that an Air so brisk in its full Freedom, must be more sensibly felt in open Places, than it can be where it is broken and interrupted in its Passage through a Wood: And I suppose
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it may be allow'd, that when the Air is fluent or rapid enough to give us Breezes or Gales, we loose our Appetite to retire into cooler Places, as we suppose those are which are gloomy and under Shade; so that either the Woods are useless to us, when there is a free Air abroad; or when the Air is of it self quiet and still, the Woods are hot and unwholesome. There is indeed always the Face of Shade in close Woods, which leads us to them in hot Weather, but that Appearance is deceitful, till the natural Evening Breeze has fann'd its Way thro' them, and condensed and fixt the Vapour which the Warmth of the Sun had raised in the Day.

However, the Edge or Border of a Wood, where the Air can have due Liberty, may be proper enough to build such a Room as I mention'd, situate, if possible, near a River, and where the Trees may interrupt the Sun's Rays at that Time of the Day when such a Room is most requir'd; which Observation, I think, is not altogether impertinent, because I have seen several Pleasure-houses, or as some call them, Summer-houses, built in such Places where the Sun lies upon them at those times when they would be the most useful, thereby rendering them disagreeable to their Design. Things of this Nature too frequently discourage our Nobility from proceeding in their Undertakings, and make them sometimes regret the Expence they have been at; 'tis therefore, I would drop as many Hints as possible, relating to this sort of Building, that my Readers may be apprised of every Thing necessary to be thought of in such a Work. As

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As for the Building it self, the Walls ought to be very thick, and the Windows so disposed, that they may, as Occasion offers, either shut out the Heat or warm Air, or be render'd capable of admitting the Light and cool Air: We may likewise observe, that in lieu of Glass, we should either use Sashes of Canvass or oyl'd Paper, which will still contribute to the Coolness of the Room, as we find by Experience in the hotter Countries.

The House, Fig. I. should, in my Opinion, be either Round or Polygonal, and not Square, because the more Sides such a Building has, the less will the Sun, if it shines upon it, be capable of heating the Walls: The Section I have given in Fig. I. will sufficiently shew the Nature of the Design; but I shall leave the rest to our able Architects, only hinting that the Pillars are not only for Ornament, but for the better supporting the Cistern of Water on the Top mark'd A. A. which is to serve the Cascades and Fountains B B B B B, which must be so order'd, that either one, two, or as many as we please, may play, and the Air thereby may be fann'd in any Proportion we desire.

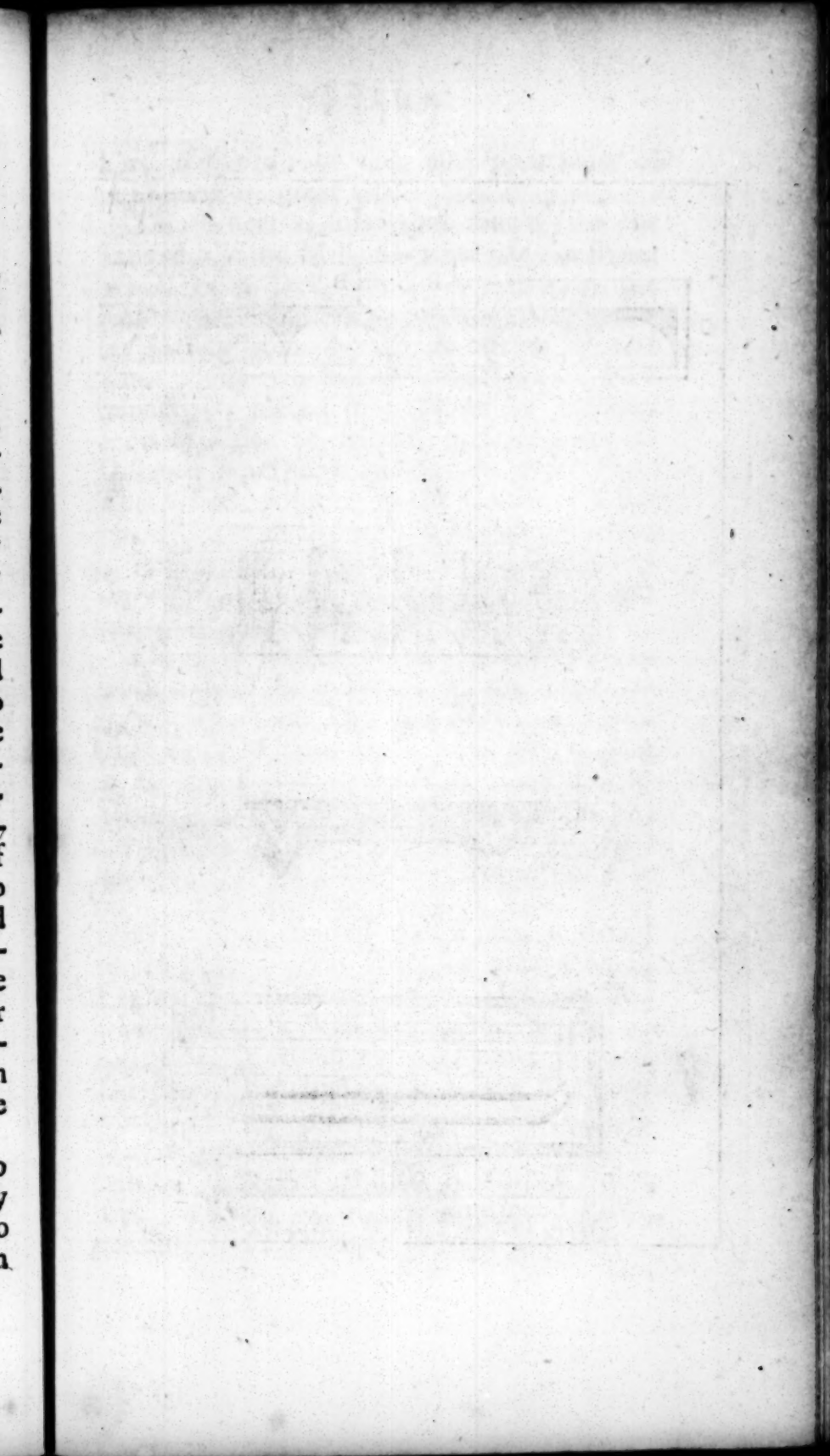
Fig. II. Shews a Chain of Buckets, which may be continually kept working, by means of a Wheel cross the River, and will constantly supply the Cistern on the Top of the House; and the Water being once brought together in a Body, and deposited in a Basen above us, will by proper Pipes give us the Jets and Cascades we desire.

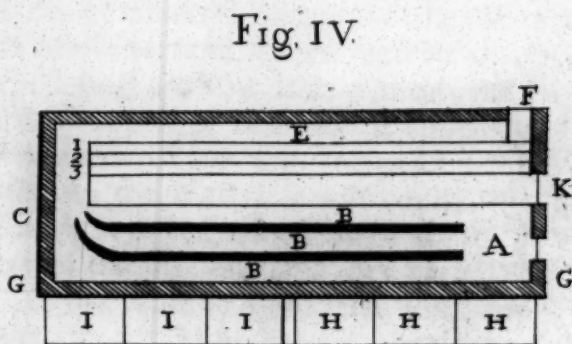
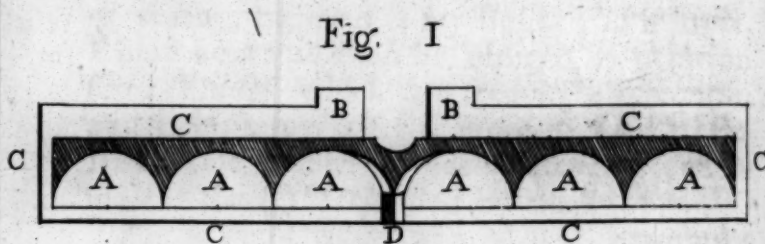
It is indeed pretty well known, that if we have Water above us, its weight will force

its way thro' Pipes, and rise with a certain strength agreeable to the height of the Body of Water ; but as it is my Business to instruct, I must now and then be obliged to mention some Things which are seemingly common, and I think my self the more obliged to do it, because I observe that whatever is common is the least regarded by the People.

So the great Wheel of a Mill is commonly known to be turn'd by the Current of a Stream, as those Wheels are, which give the Movement to the Water-works at *London-Bridge*. And I doubt not but the common People conclude, that because they can be turn'd by a Stream of Water at one time, they may by the same means be kept continually in Motion; but if we examine this case with a little more reason, we find that these Wheels stand still, and are endanger'd in great Floods, so that we cannot always have the Assistance we expect from them. The ingenious Mr. *Harding* near *Cupid's Gardens* in *Southwark*, in order to remedy these Defects, has lately invented a curious Wheel, which moves as well if it is entirely under Water, as the others do in the common Mills above the Water ; and his new invented Wheel carries this Advantage along with it, that without the Expence and Trouble of shifting it higher or lower as Waters rise or fall, or penning or damming up the Water, it will constantly keep in motion, either backwards or forwards as the Sets of the Stream or Tides vary.

As the Author has been kind enough to lend me the Model of it, with the Liberty of designing it, I think I should be unjust to him





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him, if I did not take an Opportunity of publishing its great Use.

This Wheel is somewhat fann'd like the Sails of a Wind-Mill, or rather like the flying Wheel of a Jack, which is turn'd by the Smoke of a Chimney; the Model I took my Design from, was made of two Slips of Tin, about two Inches broad, which were respectively placed in a Wormlike manner, upon an Axle-tree, so as to preserve an equal Distance from one another in every Part: This Wheel, pointing to the Course of a River, will continually keep in Motion, whether it lies deep or shallow in the Waters, or as we observ'd before, whether the Tide sets one way or the other.

The first Design of this Wheel was to work a Mill in a Barge, which might be either fix'd in any Part of a River, or moved from Place to Place as Occasion offer'd, and so to avoid the unnecessary Expence of Dams, which hinder Navigation; it likewise appears to me to be useful in any Breach made by the too great Over-flux of the Waters; for by the same Force of Water which turns it upon coming in of Tides, it would return back a great Part, by means of an Engine rightly fram'd to its Motions, and when the back Waters had the power on their side, it would not only move by their Direction, but by means of the Engine it works, carry over any Bank an extraordinary Quantity of Water, besides what would return by the Breach upon the Fall of the Tides. The Axle-tree is of one continued Piece, reaching some Distance beyond the Wheel,

and acting as a Worm or Screw, works upon a Counter Wheel; but I shall say no more at present of this Invention, the curious Inventor may better explain it. In the mean time, I shall insert a Letter I have receiv'd from the Author, which relates to the Uses of this new Water-Wheel, which I shall give my Reader in his own Words.

To Mr. BRADLEY.

S I R,

I Presume it may not be amiss to give you some small Account of the Conveniencies and Usefulness of my Water Wheel, beyond other Water Wheels.

First, That navigable Rivers will not admit of being stop'd by penning up the Water, as is requir'd for all Water-Mills now made use of; therefore such Mills are not useful therein: But my Wheel requires no penning up the Water, but may be set between two Barges, or otherwise fixt to the Ground, and is never interrupted by back Water, but the deeper it lieth in the Water, the more powerful it acts, and according as the Velocity of the Stream is, so may the Wheel be proportion'd, either for Power or Speed.

Secondly, As there are many Rivers which have quick Currents, but will not admit of penning up its Heads of Water, by reason it may endanger over-flowing the Lands adjacent, and also the erecting Mills is very expensive; but my Wheel requiring neither penning up, or such expensive Foundations, is

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undoubtedly much preferable to all others.

Thirdly, My Wheel is equally useful, at the Tail of other Mills, where the Water is deep : for Instance, at the Mill which is on *Hackney River*, to serve that Town with Water, where they have penn'd up the Water, and interrupted the Navigation, to the great Trouble and Damage of such who trade that Way ; and at the Tail of that Mill is deep Water, my Wheel would perform more Work than the first Mill doth : And also at the *Temple Mills*, the same may be done without the least Interruption to them now in Use.

SIR, I think the Conveniencies above-mentioned are sufficient to shew my Wheel to be worthy Notice ; and upon any Occasion I shall be ready and able to demonstrate, that all I have said of it is Fact.

I am, SIR, Yours,

W. HARDING.

Fig. III. represents this Wheel length Ways. *Fig. IV.* the Front View, and *Fig. V.* a different View of its Fanns length-ways, with the Manner how the Screw on the Axle-Tree turns the Counter Wheel.

As this Wheel is not only useful for Water-Works and Mills, but for draining of Lands, it may be necessary to say something of such Grounds especially, as have been overflowed by the Salt Water, and of the proper Means to be used for bringing them into an health-ful

ful Condition, for the Growth of such Vegetables as may be best cultivated upon them ; for it is my Opinion, that notwithstanding Salt is often used to enrich Land, yet where the Land has been glutted with it, as it must be where the Salt Water has covered it for a Year or more, it's vegetative Quality is poison'd, and rendered unfit for the Growth of Plants : It is therefore necessary to use proper Means for the freshing such Land, and unburdening it of its too great Saltness ; which Experience tells us, may be done by several Means, *viz.* by turning fresh Water over it Three or Four Times, or by a certain Method of Ploughing it at such Seasons, when the Sun gives us its most ardent Heat ; which Ploughings dispose the Ground in such manner, that the Sun has full Power to bring the Salts to the Surface, from whence they may be gather'd at an easy Rate, and be made to render an extraordinary Profit, as I shall explain hereafter. But even when the Ground is thus rectified, it is necessary to judge rightly of the Plants proper for it ; for some Places will yet require Plants which naturally imbibe great Quantities of Salt, and others of such Grounds must first be prepared by certain Plants, which, tho' their Crops will not yield much at the Markets, yet their Ashes will be useful in many Cases, and the Manner of their Growth will be such as will render the Soil mellow, and prepare it for profitable Crops. In this Case particularly, let me advise, that the Land Owners be not too hasty in sowing of Corn, or those advantageous Grains which are cultivated near them, where such Drown-
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ing has not been ; there must be some Time allowed for their overflow'd Lands to recover themselves ; and the very preparing them, if it is well manag'd, will carry Profit enough with it. The Lands about *Dagenham* are of the Kind I speak of; an Account of which, and the Method of improving them, I have now by me, and shall readily communicate to such Persons as are willing to follow the Methods I prescribe: For it has been a Rule which I would ever observe, to found all my Studies upon Experience, tho' it happens sometimes to be very expensive ; however, there is indeed a great Pleasure in making now and then an useful Discovery; but the Tryals are attended with so many Uncertainties, that without the Inventions of Use pay for the Expence of the others, such Studies must soon be at an End. For my own part, I must confess I have met with some generous Encouragement to pursue the Study of the Nature of Plants and Soils, and for the Improvement of Land ; and I can at the same Time affirm, that my own Expences upon that Occasion only has amounted to upwards of Two Thousand Pounds; for I was perswaded I ought not to miss any Occasion that offer'd (tho' never so far distant from the Place where I was) whereby I might improve the little Knowledge I had before, nor did I ever regard the Expence which might bring me to it. Besides the Learning of the Schools, I judg'd it necessary to survey the Structure and Parts of Animal Bodies, and from the different Frame and Order of their Parts, to become acquainted with the Reason and Method

thod of the Circulation of their Juices, imagining there was some Analogy between Animals and the Plants, which were the Favourites of my Genius; by the visible Parts in the Animal Kingdom, I was directed to those which had been secretly conceal'd in the other. This I got over pretty well, after having been present at many Dissections of Human and other Animal Bodies, and comparing their Anatomy with the Anatomy of Plants; but then I found it necessary to inform my self of the natural Food of every distinct Species among Animals, and how much Difference of Climate concern'd their Welfare; which led me to a numerous and expensive Correspondence, by which means I reap'd many good Instructions, and learnt how useful it would be to my Studies to see a Course or two of Chymistry, that thereby I might discover the several Qualities in Earths and Minerals, and give the Analysis of the several Plants nourish'd by their Means; from whence I might judge with more Certainty, on any particular Occasion, what Soil would be most proper for any distinct kind of Vegetable. This brought me to many make Experiments, which had their share of Expence; and the great Number of curious and valuable Plants, which I collected from the most noted Parts of the known World, exceeded the Charge I had been at in all the other Branches of my Studies; for to know something of Anatomy and Chymistry, to view the State of Vegetables abroad, and to receive good Instructions from my Correspondents, could not be brought to the Use

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Use I intended, without a good Number of Materials to work upon. Thus having amass'd a number of Curiosities, which rival'd the most valuable Collections in *England*, of the same Nature, I began to frame a Course of Experiments in Husbandry and Gardening; and from the great Fund of Matter I had to work upon, now and then hit upon some Improvements which had never before been thought on; out of which I had began to collect and place in Order such as might be useful, and serve as Examples for the Practice and Advantage of the Publick: But Affairs of another kind hinder'd me from prosecuting this Design, or by this Time I might have been able to have shewn in Practice above an Hundred new and instructive Rules. I have been more particular in this Relation, because those who study the Arts of Gardening and Husbandry, should know that there is required the Assistance of those Sciences, which at present make the greatest Figure in the World; and that Men of that Business, who are well skill'd in their Profession, may be rank'd with great Philosophers, and deserve Honour, rather than what the generality of Gardeners commonly meet with from the Publick: But indeed we ought to observe this by the by, that every profess'd Gardener has not the same Right of Respect as another; some are excellent, others are not so.

Again, in what I have mention'd, it may be observ'd how necessary it is, that those who study either the Improvement of Gardening or Husbandry, should search into the Rules

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and Order of Nature ; and that there is no Study too high for them to undertake, if they would illustrate their Practice, or make it gainful or honourable to them : But my Aim being general, and for the Improvement of universal Knowledge, my Method was new, and therefore was more expensive, than it need be to others ; the Students in Gardening may now inform themselves at a much cheaper Rate than I did. It would surely be much to their Advantage, was there a Garden erected at the publick Expence, or in such a manner as the Undertaker should not be a Looser, wherein every Experiment already discover'd should be expos'd and explain'd in due Order ; and from Time to Time as other new Discoveries happen'd to be made, they should be collected and added to the rest for general Instruction. I should be ready for my Part always to assist in such an useful Design ; and if any Noblemen or Gentlemen are willing to contribute to such an Undertaking, and will be pleased to send their Thoughts of it directed to me at the Publisher's of these Papers, I shall take an Opportunity of informing them, from Time to Time, what Encouragement it meets with.

The Method I would prescribe for such a Garden is as follows.

1st. That there should be Specimens collected of every Kind of Soil to be found in *Britain* ; with Accounts, if possible, of all the Plants growing wild, or naturally upon them.

2^{dly}. That the several Methods of producing Artificial Heat should be there practised,

fed, so that the different Climates might be imitated.

3dly. That there should be Models of every kind of useful Carriage, Plough, or such Instruments as are now in Use, or may be invented, for easy Conveyance of those Things necessary for the Use of Farming, or Opening or Turning up of Ground.

4thly. That there be Models of all the Contrivances for raising and forcing of Water, and for draining of Grounds.

5thly. That there be Examples, as many as possible, of such foreign Plants as will stand abroad in our Clime; and a constant Correspondence kept with Traders in those Parts which come nearest our Climate, in order to bring their Plants of Use to be naturaliz'd with us. I have already made several Exotick Plants familiar with us; the Capér, for Example, I have brought to that Perfection, that it bears Flowers and Fruit in the open Air, without any Shelter, as well as it does about *Thoulon*: It had often been cultivated in our Stoves and Green-houses, but with all the Care imaginable, did not blossom any where but at *Badminton*, till I sow'd the Seeds of it in some old Garden Walls, where it now grows and flowers every Year, making Shoots above a Yard long in a Summer.

6thly. To plant Trees at every Season of the Year, as has been practis'd by the Honourable *James Johnston*, Esq; at *Twittenham*, and with some Improvements upon that Gentleman's Invention.

7thly. To try every Season of the Year for sowing of Corn and transplanting it, which has been done by some with great Success; and to sow and plant one sort of Corn in every kind of Earth, and in as many Mixtures as can be thought on.

8thly. To make Experiments for the Cure of Distempers in Plants and Trees, and for repairing the lost Vigour in old Trees, by inarching their decaying Branches into new Stocks; which I have experienced to do wonders, and I think am the first who invented that Way.

9thly. To collect all variegated Plants, thereby to explain the Circulation of the Sap. Mr. Fairchild, who has now upwards of an hundred Sorts of striped Plants, has so many Instances to confirm the Sap's Circulation, in the Experiments he has already made with them; this Circulation is proved beyond Dispute.

10thly. To prepare a Set of Fruit Trees for Walls in such a Manner, that they may be safely removed to any Distance, already pruned and spread, and at any Season; this I contriv'd, chiefly for the Use of such Gentlemen who are willing to gain Time, and plant their Gardens with Trees that would bear Fruit the first Year they were planted.

11thly. To have a Set of Fruit-Trees pruned and spread upon Espaliers, as they should be against Walls, for the Instruction of the Students in this Art; and by Wyers, every Branch which is cut from the Tree to remain at its proper Place of Growth, that the Condition of the Tree in the foregoing Year

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Year may be seen, and the Effect of such pruning may be observ'd at the same Time. This is the more necessary, because, besides the different kinds of pruning required for Fruits of different Tribes, as that Plums should not be prun'd like Peaches, Peaches like Cherries, Cherries like Pears, &c. almost every different kind of these require a different kind of pruning agreeable to their different Manners of shooting, or with regard to the Time such Shoots take to put out Blossoms.

12thly. To shew the different Ways of managing Vines, with the various Methods of pruning them, to help their Bearing, and the early ripening of their Fruit, either against Walls, Espaliers, or in the Manner of Vineyards; which last Method I have practis'd with great Success in *England*; and I rather mention it here, because I have prevail'd on Mr. *Thomas Fairchild*, to make a large Plantation of his finest forward sorts of Grapes for that Use.

In a Design of this kind, there might be many other useful Things thought on, which would be necessary to instruct the Lovers of Gardening and Husbandry, and might be a Means of improving our Lands to great Advantage, and also of preventing many Losses which happen daily thro' the unadvised Practice of the Unlearned.

One might add to this, how useful it would be to every kind of Planting, to study various Compositions of viscus Matter, to be used in transplanting Trees, and for invigorating them, where there should be

be Occasion ; for I find already, by Experience, that some viscous Bodies are extremely useful on many Occasions.

Among other Things which I shall insert in this Monthly Treatise, I think it very necessary to communicate some useful Observations of the often commended *Mr. Thomas Fairchild of Hoxton*, who has lately furnish'd me with some excellent Directions for the Improvement of Gardening ; which the more I reason upon, the more I am perswaded he is in the right ; but his Veracity is already as well known, as his Skill is unquestionable : And indeed 'tis by conversing with such Men who have a true Bent of Genius to their Business, and Time and Opportunity for Practice, that a curious Man may receive Instruction ; and not to have too great an Opinion of one's self, which is always an impregnable Bar against Reason, upon which the Arts of Husbandry and Gardening chiefly depend. Nor indeed are there any Studies which depend more upon Natural Philosophy than these two ; and yet, as *Mr. Fairchild* very well observes, the Persons to be educated in them have less Opportunity of learning their Business, as the Case now is, than any other Calling whatever : For, says he, when a Person serves his full Apprenticeship to either Gardening or Husbandry, he has not Opportunity of seeing his Business at most above seven Times in seven Years ; but in other Arts, the Students in them may daily observe what they desire.

In Gardening and Husbandry, the Practice of what is necessary to be understood by every

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ry one, is pinn'd down to a certain Month, and a certain sort of Weather, which must be regarded, or it will not succeed or answer the End proposed, if we are not punctual in those Points; but in other mechanical Studies, we may practise any Thing at any Time, and our Endeavours will be equally successful.

The Apprenticeship which is serv'd to Gardening may, to a good Genius, furnish some necessary Principles, which more Time, reasonable Enquiry, and sound Practice may bring forward, towards the necessary Qualifications required in a Gardener; or like the Learning in the Schools, improve more and more as the industrious Students cultivate their Time discreetly: And 'tis therefore in Gardening as well as other Philosophical Studies, there ought to be proper Academies erected for the better Instruction and Information of the Persons who intend to profess the Art; then might every Practitioner be led to a reasonable Judgment and Understanding in his Calling, and give the World that Satisfaction which would redound to his Advantage, and prevent many Miscarriages which now too often happen.

In the Reign of King *James* the First, the same Thought was propagated so far, that His Majesty granted a Charter, with many Privileges, to the Gardeners in and near *London*, to prevent the Utterance of such Goods relating to Gardens, as were unwholesome or unwarrantable; that Charter being still in full Force, I have had it sent me by a Gentleman of Distinction, to insert

sert as it was taken from the Records, esteeming it will be of Benefit to many, who at present practise without the Knowledge of it, and be a means of preventing the Loss they might sustain by vending or uttering such Plants, Seeds, &c. as the Charter mentions, without a due Liberty granted by the Company of *London* Gardeners. I could add other Reasons why the Abstract of the Gardeners Charter should appear in Publick; but I shall refer my Reader to the Remarks which my Friend has made upon the several Paragraphs, which I shall give in his own Words before I conclude this Month's Papers. In the mean while, I proceed to Mr. *Fairchild's* Observations, which here take Place according to the Time I have enter'd them in my Diary; and I hope my Reader will excuse me, if I do not in this Work observe so just a Connexion as I might in one of another kind, as long as I give him useful Relations of Things, gather'd sometimes from Conversations, Experiments, and Letters from Persons of Worth and Honour, and sometimes as they happen to arise from my own Practice; but an Index may partly make amends.

Observations and Experiments by Mr. *Thomas Fairchild*, at *Hoxton*.

THE First relates to the Manner of Building of Walls for the Advantage of Fruit-Trees, but in particular for Peaches, which never thrive well in Gravelly Grounds. He
ob-

observes that all Peach-Trees growing in a shallow Soil with a Gravelly Bottom, canker and decay as soon as they reach the Gravel, and that, because they want a due Quantity of Moisture; therefore he advises that where such Ground is, the Wall should be built upon Arches, each Arch four Foot wide, and the Peers between them two Foot a-piece, the Top of the Arches to be as high as the Surface of the Border, the Wall to face the South Sun; to which Aspect he would plant his Peach-Trees at twelve Foot distance, which is a Tree in every other Arch; and on the North Side of the same Wall, to plant other Fruits in the vacant Arches: Thus, says he, the Peaches will have the Benefit of the Sun upon their Branches; and besides, having double the usual Liberty of spreading their Roots, those Roots will partly be shaded, and have a due share of the North Border, and Moisture to nourish them and their Fruit; by which means, they will be kept free from Cankers, and the Curling of the Leaves, which is commonly a Fore-runner of Death. Between these Peach-Trees, on the South Side Vines may be planted.

On the other hand, he observes that those Trees which are to be planted on the North Side of the Wall, will be much assisted in their Vigour, and the forwarding their Fruit, by the Warmth of the Sun falling upon their Roots on the South Side of the Arches.

In the same Day's Conference with him, he inform'd me, that Vines and Hony-suckles shed their rough Bark every three Years; and that he had experienced, it help'd such Plants

to take away from them the rough, black, stringy Parts when they appear'd, which otherwise, were they to be left on, would choak the young growing Bark, and hurt the Growth of the Tree.

Concerning the Generation of Plants, and which may help to support that Opinion, he observes, that the Orange-Tree has Male and Female Blossoms, the Male having only the Stamina and Apices, with their Dust, and the Female Blossoms a large divided Pistillum. Further he adds the Case of the *Hermaprodite* Orange, where we find upon the same Tree compleat Oranges, compleat Lemons, and sometimes half an Orange join'd to half a Lemon, and the Orange and Lemon Fruit quarter'd regularly: And with this he also mentions a Vine which he receiv'd from the curious *Samuel Reynardson*, Esq; of *Hillington*, which in some Parts bears Bunches of Black Grapes, in others White Grapes, some Bunches half Black and half White Grapes; and what is more extraordinary, in many Places there are single Grapes strip'd with Black and White, which, says he, could in neither of these Cases happen by Grafting; but supposes that the Dust of the Male Flowers of an Orange impregnated the Female Flower of a Lemon, or the contrary; so the Grape I have mention'd seems to have been thus variegated in its Fruit by the coupling of a White Grape with a Black Grape, and I am purely of his Opinion.

In the next Place he is now practising several Experiments to give us further Proofs of the Circulation of the Sap in Plants: We have

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have already observ'd, that by Budding or Inoculating the strip'd Jessamine upon the common sort, we shall find Rudiments of that Stripe communicate it self to many Parts of the Tree, even ten or twelve Foot distant from the Bud; which makes it plain enough, that Juices circulate in Plants: But Mr. *Fairchild* is now going farther in the Proof, by Graffing the Brazil Jessamine upon the edged Leaf Common Jessamine, and making that become variegated, and has likewise graffed the strip'd spurge Laurel upon the Mezereon, which grows very well; but as it is the first Year, we are yet to expect the Event: If this succeeds as I expect, I shall then be particular of the Use of this Discovery of the Circulation of Sap in Plants, which will open a new Scene as admirable as it will be generally beneficial, and greatly improve the Arts of Husbandry and Gardening.

I now proceed to give my Reader a View of the Encouragement given to the Society of Gardeners, in a Charter granted them by King *James* the First; where we shall find, besides many Privileges granted to that Company, how much that Prince encouraged Arts that might be of Publick Benefit.

To Mr. BRADLEY, Fellow of the
Royal Society.

S I R,

I Have had a mind some Time since to print
an Abstract of the Charter granted to the
Gardeners of *London*; but as I observe in the
News, that you invite the Lovers of that
Profession to send you such Matter as may
be advantageous to Gardeners, I think you
may do them Service in publishing it, and if
you think proper, may add the Remarks I
have made, but I leave that to your self: The
Charter begins thus.

JAMES, by the Grace of God, King of Eng:
land, Scotland, France, and Ireland, De-
fender of the Faith, &c. Whereas divers and
sundry Persons inhabiting within the City of
London, and six Miles Compass thereof, have
continually taken upon them to use and practise
the Trade, Craft or Mystery of Gardening, Plant-
ing, Graffing, Setting, Sowing, Cutting, Ar-
bouring, Rocking, Mounting, Covering, Fen-
cing and Removing of Plants, Herbs, Seeds,
Fruits, Trees, Stocks, Sets, and of contriving
the Conveyances to the same belonging, being
therein Ignorant and Unskilful, having not been
brought up in the said Trade or Mystery; and
whereas the said Persons have also daily
sold and set unto our loving Subjects, into
sundry the Parts of our Dominions and
Countries, dead and corrupt Plants, Seeds,
Stocks, and Trees, to the great Deceit and
Loss of our said Subjects: For Redress and
Pre-

' Prevention of which Deceits and Wrongs, we
 ' did by our Letters Patents, in the Third Year
 ' of our Reign over this our Kingdom, grant
 ' to the Gardeners, then inhabiting in *London*,
 ' and within six Miles of the said City, that
 ' they should be one Body-Corporate, by
 ' the Name of Master, Wardens, Assistants,
 ' and Commonalty of the Company of Gar-
 ' deners of *London*, and did thereby give un-
 ' to them divers Powers and Privileges, as
 ' by our said Letters Patents appeareth; and
 ' whereas we are credibly inform'd that there
 ' are certain Defects, Questions, and Doubts
 ' found and arisen in and upon our said Let-
 ' ters Patents, whereby the Publick Good
 ' and Profit of the said Company is much
 ' hindered, and the Abuses aforesaid still con-
 ' tinued; which Company of Gardeners have
 ' hereupon made their humble Petition unto
 ' us, that we would be graciously pleased to
 ' renew the said Letters Patents with Amend-
 ' ment of those Defects, and with such other
 ' necessary Additions and Alterations as we
 ' shall think most fit and convenient. Know
 ' ye, &c.

It is to be noted, that this Charter was
 granted at a Time when the Buildings in
 and near the City of *London*, were not half
 so many as they are at this Day; there were
 then many Intervals between the several
 Houses in *London* and *Westminster*, and other
 Places, which at present are join'd with the
 City. Within the Memory of Men now li-
 ving, *Somerset-House*, and the Buildings there-
 abouts, were stiled Country-houses, and the
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open Places about them were employ'd in Gardens for Profit; and many Parts now within the City and Liberties, were then in the Possession of Working Gardeners, who were at that Time enough in Number, and employ'd Ground enough to furnish the Town with Garden Necessaries, for then there were few Herbs used at the Table with regard to what there are now; but the Success which those regular Gardeners met with at that Time, encouraged many others to set up and profess the same Calling near *London*, who so unskilfully went to work, that many Abuses were committed, and the Subject was injured by them; the Gentry and Nobility lost the Certainty and Advantage of their Designs, by employing Persons of no Experience; and therefore it was propos'd that the *London* Gardeners, who were profess'd Men, should become a Body, and inspect the Worth of others who pretended to practise without Knowledge, or should offer to invade their Customs. In the same King's Time, I am inform'd, there was an Academy establish'd in *Scotland*, for the Improvement of Gardening, which some Persons of that Country tell me is continued and upheld to this Day, which has the Privilege of examining every Person concern'd in that Business, and of allowing or disallowing their Practice, as the Professors find the Persons examin'd are more or less capable of acting as Gardeners; and moreover it is said, that this Society dictate to the Students in this Art, at fixt Times, such Rules as they are to follow, and reason in Publick with them upon every useful Subject

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ject in Gardening: And I wish there was the same Opportunity of improving the young Gardeners with us; for Conversation promotes Experience, and Experience leads us to Perfection.

But as the Company of Gardeners were establish'd by Charter in *England*, in the Third Year of King *James* the First, the said Company were afterwards forced to solicit an additional Power, as we may observe they obtain'd in their present Charter; yet as the Town encreas'd in its Buildings, the Company was invaded by many who called themselves Gardeners, and had not the Privilege of their Charter; for still as the Town encreas'd in Buildings, there was more Profit for those who came to Market, as there must necessarily be more Inhabitants; and thro' the unskilful Practice of many who brought unhealthful Herbs to *London* at that Time, I am told there was a Proclamation issued out by King *Charles* the First, directing all Magistrates to assist the said Company in the Execution of the Powers granted them in their Charter, or to that purpose: It is certain, however, there was then a Proclamation very much in their Favour.

I cannot however leave this Article without remarking two Things; the First is, that most of the large Mulberry-trees, which we find in or near *London* or *Westminster*, were planted in King *James* the First's Reign, on account of establishing the Manufacture of Silk; that Prince having written a Letter to the Lords Lieutenants of the several Shires of *England* for the increasing of Mulberry-trees,

trees, and the Breeding of Silk-worms, which was then thought would add Riches to our Nation; and was it now set heartily about, it might certainly prove very beneficial to the Publick, and employ a great many Hands which are now idle. The Letter contains an excellent Lesson to the Lovers of their Country, and is as follows.

JAMES Rex.

Right Trusty and Well-beloved, we Greet you well.

IT is a principal Part of that Christian Care, which appertaineth to Sovereignty, to endeavour by all Means possible, as well to better, as to encrease among their People, the Knowledge and Practice of all Arts and Trades, whereby they may be both weaned from Idleness, and the Enormities thereof which are infinite, and exercised in such Industries and Labours as are accompanied with evident Hopes, not only of preserving People from the Shame and Grief of Penury, but also raising and increasing them in Wealth and Abundance, the Scope which every free-born Spirit aimeth at, not in regard of himself only, and the Ease which a plentiful Estate bringeth to every one in his particular, but also in regard of the Honour to their Native Country, whose Commendations is no way more set forth than in the People's Activeness and Industry. The Consideration whereof having of late occupied our Mind, who always esteem our Peoples Good, our necessary

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necessary Contemplations: We have conceiv'd as well by the Discourse of our own Reason, as by Information gathered from others, that the making of Silk might as well be effected here as it is in the Kingdom of *France*, where the same hath of late Years been put in Practice; for neither is the Climate of this Isle so far distinct or different in Condition from that Country, especially from the hither Parts thereof, but that it is to be hoped that those Things, which by Industry prosper there, may by like Industry used here have like Success; and many private Persons, who for their Pleasure have bred of those Worms, have found no Experience to the contrary, but that they may be nourish'd and maintain'd here, if Provision were made for planting of Mulberry-trees, whose Leaves are the Food of the Worms; and therefore we have thought good hereby to let you understand, that altho' in suffering this Invention to take Place, we do shew our self somewhat an Adversary to our Profit, which is the Matter of our Customs; for Silk brought from beyond the Seas will receive some Diminution: Nevertheless, when there is a Question of so great and publick Utility to come to our Kingdom and Subjects in general; and whereby (besides Multitudes of People of both Sexes, and all Ages) such as in regard of Impotency, are unfit for other Labour, may be set on Work, comforted and reliev'd; we are content that our private Benefit shall give Way to the Publick: And therefore being perswaded that no well-affected Subject will refuse to put his helping

Hand to such a Work as can have no other private End in us, but the Desire of the Welfare of our People ; we have thought good in this Form only to require you (as a Person of greatest Authority in that County, and from whom the Generality may receive Notice of our Pleasure, with more Conveniency than otherwise) to take Occasion, either at the Quarter-Sessions, or at some other publick Place of Meeting, to perswade and require such as are of Ability (without descending to trouble the Poor, for whom we seek to provide) to buy and distribute in that County the Number of Ten Thousand Mulberry Plants, which shall be deliver'd to them at our City of, &c. at the Rate of Three Farthings the Plant; or at Six Shillings the Hundred, containing Five Score Plants. And because the buying of the said Plants at this Rate may at the first seem chargeable to our said Subjects, (whom we would be loth to burden) we have taken order that in *March*, or *April* next, there shall be deliver'd at the said Place a good Quantity of Mulberry-Seeds, there to be sold to such as will buy them; by means whereof the said Plants will be deliver'd at a smaller Rate than they can be afforded, being carried from hence: Having resolv'd also in the mean Time, that there shall be publish'd in Print a plain Instruction and Direction, both for the Increasing of the said Mulberry-trees, the Breeding of the Silk-Worms, and all other Things needful to be understood for the

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the perfecting of a Work, every way so commendable and profitable, as well to the Planter, as to those that shall use the Trade. Having now made known unto you the Motives as they stand with the publick Good, wherein every Man is interested, because we know how much the Example of our own Deputy-Lieutenant and Justices will further this Cause, if you and other your Neighbours will be content to take some good Quantities hereof to distribute upon your own Lands, we are content to acknowledge thus much more in this Direction of ours; that all Things of this Nature tending to Plantations, Increase of Science, and Works of Industry, are Things so naturally pleasing to our own Disposition, as we shall take it for an Argument of extraordinary Affection towards our Person; besides the Judgment we shall make of the good Dispositions in all those that shall express in any Kind their ready Minds to further the same; and shall esteem that in furthering the same, they seek to further our Honour and Contentment, (having seen in few Years past, that our Brother the *French* King hath, since his coming to the Crown, both began and brought to Perfection the making of Silks in his Country, where he hath won to himself Honour, and to his Subjects a marvellous Increase of Wealth) would account it no little Happiness to us, if the same Work which we began among our People with no less Zeal to their Good (than any Prince can have to theirs) might in our Time produce the Fruits which there

it hath done: Wherefore we nothing doubt, but ours will be found as tractable and apt to further their own Good, now the way is shewed them by us their Sovereign, as those of *France* have been to conform themselves to the Direction of their King. Given under our Signet at our Palace of *Westminster*, the Sixteenth of *November*, in the Sixth Year of *England*, *France*, and *Ireland*, and of *Scotland* the Two and Fortieth.

This Letter had so good an Effect, that several People began to propagate Silk-worms; but for want of good Order among them, their Labours came to little. The other Observation is, that before the Buildings in *London* and *Westminster* became contiguous, Roses would blossom in *London*; but since the burning of *Newcastle Coal*, and the vast Increase of Building, we find by Experience in the most open Parts of the Town, they will not thrive enough to blossom.

The next Thing to be observed in the Gardeners Charter runs thus:

THAT from henceforth all such Person or Persons as now are Freemen of the said Company of Gardeners, and all other Person or Persons to be admitted into the said Company according to the Provisions in these Presents expressed, and which are or shall be inhabiting in *London*, or within Six Miles about the said City only, and none other, shall be one Body Corporate and Politick in Deed and in Name, by the Name of Master, Wardens, Assistants, and Commonalty

monalty of the Company of Gardeners of
 London, &c. and that by the same Name
 they shall have perpetual Succession, &c.

Then after a formal Set of Words, we find
 full Power and Authority is given them to
 have a Publick Seal to be alter'd at their
 Pleasure, and that the Company may purchase
 Lands, &c. and the *Wednesday* in *Whitson-*
Week every Year they are to 'Nominate, E-
 'lect Chuse and Swear one Master, two
 'Wardens, and four and twenty Assist-
 'ants, to be chosen out of the said Com-
 'pany of Gardeners, who shall Order, Rule
 'and Govern the said Corporation.

It is then said that,

'It shall and may be lawful to and for
 'the Master, Wardens and Assistants for
 'the Time being, or the greater Part of
 'them, to admit into the said Company
 'such Person or Persons as they in their
 'Discretion shall think meet; and they
 'have also a Power to take and keep as
 'their Apprentice or Apprentices, all and
 'every such Person or Persons as will bind
 'themselves Apprentice or Apprentices for
 'the Term of Seven Years and upwards.

N. B. The Place of Meeting at present
 of the Company of Gardeners is in the
Irish Chamber, Guild-Hall, where such Per-
 sons (as I am inform'd) who apply to them
 may be admitted, provided they are duly
 qualified to exercise the Art of Gardening.

' And

' And further we will, and by these Pre-
 ' sents for us, our Heirs and Successors,
 ' do straightly prohibite and forbid that
 ' no Person or Persons whatsoever, inhabi-
 ' ting within the said City of *London*, or
 ' the Liberties thereof, or within Six Miles
 ' Compass of the same City, do at any
 ' Time hereafter use or exercise the Art
 ' or Mystery of Gardening within the said
 ' City of *London*, or the Liberties thereof,
 ' or without the same within Six Miles
 ' Compass of the same City, either in Places
 ' Privileged, or not Privileged, what-
 ' soever, without the License and Consent
 ' of the Master, Wardens and Assistants of
 ' the said Company for the Time being,
 ' or the more Part of them, thereunto first
 ' had and obtained, other than such of our
 ' Subjects as shall Garden for their own
 ' Household and private Spending; and that
 ' no Person nor Persons being not admit-
 ' ted of the said Company, and dwelling
 ' above the space of Six Miles from the said
 ' City of *London*, shall from henceforth sell
 ' or put to sale, or offer to put to sale, any
 ' Plants, Herbs, Roots, Seeds, Trees,
 ' Stocks, Slips, Sets, Flowers, or other
 ' Things usually sold by Gardeners, within
 ' the City of *London* or within Six Miles
 ' of the said City, but only in and at such
 ' accustomed Times and Places as the Foreign
 ' Baker and other Foreigners, being not free
 ' of our said City, use to do with their Bread
 ' or other Victuals; and then also shall depart
 ' the said Places or Markets with their said
 ' Goods by them to be brought for Sale, &c.
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‘ upon pain of Forfeiture of such Plants,
 ‘ Herbs, Roots, Seeds, Trees, Stocks, Slips,
 ‘ Sets, Flowers, &c. all which Forfeitures
 ‘ shall be distributed amongst the Poor of the
 ‘ Place where such Forfeitures shall be taken.

And after this we find that the Master and Wardens, or any two of them assisted by two of the Assistants, have full Power to make such Seizures, and to search and view all manner of Plants, Stocks, Sets, Seeds, &c. in any Market within their Limits, to see if they are sound, good, wholesome, and merchantable; and if such Goods are deceitful, unwholesome, dry, rotten, &c. they are to seize them, and to burn or consume them, with the Assistance of the Clerk of the Market. And then the Charter sets forth the Company's Power to make Laws, Constitutions, &c. for the good Government of the Master, Wardens, &c. and further commands, that the Lord Mayor within his Liberty, and the Justices of the Peace in the Limits of this Company's Power, shall, upon such Offences as shall be committed against the Company, commit such Offenders to the next Goal till they have satisfied the Company in their Demands for the Offence committed.

Thus, Sir, I have given you the most remarkable Passages in the Gardeners Charter, in order to have them publish'd if you think fit, among your Observations in Gardening and Husbandry: I am perswaded you will oblige many of the Gardeners by it, for all of the regular Professors have not every Day
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the Opportunity of consulting the Powers granted them; and the Practitioners who have at present no Interest in the Charter, may be inform'd of the Company's Power over them, and prevent Losses which else might happen to them by offering such Things to sale as are unwarrantable; and I suppose it may be one Means of keeping the Markets stored with those Herbs and Fruits which are fresh, wholesome, and uncorrupt, which some learned Physicians think ought to be as much observ'd as the Goodness of other Meats; for Herbs as well as Flesh, if they are stale and corrupted, contribute to the ill Health of the People.

There is one Thing more which I cannot avoid remarking before I conclude, and that is, the Abuse which is frequently committed in the Markets by the Higlers in Plants, who impose upon the Buyers rotten or decay'd Plants, Trees and Herbs, without any possibility of growing; which is not only a Disappointment to the Purchasers, but likewise an Injury to the Practical Gardeners, who in the Plants bought of them have no room to impose at that Rate. There are enough about *London* who keep Gardens on purpose for such Supplies as the Town require; and it is very reasonable to suppose, that the Plants educated in the Sulphurous Air partaking of the *London* Smoke will more readily thrive in or about the Town, than those which are brought from distant Places where the Air is clear and thin. All this I submit to you, because you have already in your Writings promoted the Gardeners Welfare in many

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Instances, and it may be a Means of joining with the present Company of Gardeners a Set of ingenious and able Persons, which may add to its Honour and Reputation.

I am, SIR, Yours, &c.

L. MUSGROVE.

Remarks on the Weather, and Produce of *June*.

FROM the Beginning of this Month to the 16th Day, the Weather was cold and very rainy, the Wind all that time at West, and sometimes blowing hard; but some Thunder Showers falling, the Wind changed as usual, and we have had hot Weather to the End.

I cannot help remarking in this Place an Observation of the curious Mr. Barham, F. R. S. which he made 3 or 4 Years ago in his Voyage from *Jamaica* to *England*, in part of *May* and *June*, and has since been observ'd by others in the same Passage about the same Season; which I believe may serve to account for the cold Air and the Wet, which commonly happens more or less about this Time of the Year, when the Wind is at West especially. Mr. Barham inform'd me, that in the Western Ocean he met several large Islands of Ice coming from the North, and making their Way towards the Line; from which arose so great an Exhalation and Fog, that the Ship was often in

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Danger of falling foul of them: Some others tell me, some Islands of this kind have been lately seen, which measured about 60 Miles in length, which must consequently emit a prodigious Quantity of Vapour, enough to produce such Clouds as might very reasonably afford us the great Quantity of Rain we have had fallen at the Time of their Passage; so that we may expect yearly about the same Time cold Rains, or Hail-Storms, in greater or less abundance as these Islands of Ice are more or less in Quantity, or some Days sooner or later as they happen to be in their Passage to the Southward.

From these Storms we are apt to receive great Damage in our Fields, Orchards and Gardens; they lay the Corn, bruise the Fruit sometimes, so as to destroy it quite, or give Room for noisome Insects to annoy it, and I have known many fine Plants and Flowers entirely ruin'd by them: But if in lieu of these Storms, the Weather is settled Rain for 8 or 10 Days, the Farmer is in danger of loosing his Hay, or having its Colour changed, which lowers its Value in the Markets; and the Cold, which attends such Rains, retards the ripening of Fruits, and renders them insipid even when they come to be ripe.

The dark Weather of this Season was so injurious to the Gardens, that our first Cabbages were not in the Markets till the Beginning of the Month, and then held at one Shilling or Ten-pence a piece for a Week, or more; about which Time a greater Quantity being brought to London, their Price fell to
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one Fourth Part, and towards the End to an indifferent Market Price: In the mean while, Collyflowers had much the same Turn, and became of very little Value in the End of the Month, thro' their extravagant Numbers. About the Middle of the Month, most of the Crops of Pease and Beans about *London* were ripe, and came daily in such Quantities to the Markets, that their Price was reduced to about one Shilling *per* Bushel, unless such only as were of the finest sorts, brought from particular Gardens.

About the Fifteenth, I saw several small Melons, and some Masculine Apricots, with some Codlins as large as Walnuts; the mean while, Cherries of most kinds were in the Markets at moderate Prizes, and Cucumbers at the latter End kept their Price at one Shilling *per* Dozen, if they were good Fruit: About the 20th, the Red and White Currants began to ripen, and towards the End were very plentifully brought to Town, as also Raspberries, and the Green and Red Kinds of Goosberries full ripe in great Abundance; and we had yet some of the Wood Strawberries.

There were to the last Goosberries of the common Kinds for Tarts, which did not seem to promise ripening in less than fifteen Days good Weather.

All this Month we had Turneps, Carrots and Onions, which were well appled, fit for boyling, at a middle Price, and Artichokes were extreamly cheap.

From Observations of this kind, I propose the Publick may reap some little Advantages;

vantages; and however slow such trifling Appearances may move, we may be assured their End is safe and secure: We may be satisfied from such Remarks what we may expect in the several Seasons of the Year, even when they have been curb'd by Weather as bad as we have had since the Spring began; we may judge how much the Price of any Commodity is raised or fallen in the Markets by its Scarcity, or over Abundance, and from thence learn how to proportion our several Crops, that every one of them may be able to pay the Expence of raising and bringing to Market, which some of them do not as the State of Gardening now is: Therefore I think it will be no bad Advice to the Gardeners and Husbandmen, to perswade them to General Meetings now and then, to consult about the State of their Crops, and thereby prevent the too great Glut of any one Thing; and contrive to have their Crops follow one another, and not as they do at present come in all together, to their own Prejudice and the Discontent of the Buyers, who certainly would rather chuse a long Continuance of useful Fruits or Herbs, than to be surfeited with them at once, or to enjoy them only a few Days, and want them all the Year besides: But some few are indeed wise enough to consider this with such true Judgment, that they gain at least four times as much by their latter Crops, as they would have got if they had push'd their Fortunes in the first Season.

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An Experiment upon the Discovery of the Circulation of Sap in Vegetables, whereby old Trees may recover their former Vigour, and such as are distemper'd may be restored to perfect Health.

SO useful is the Discovery of the Sap's Circulation in Plants, that without that Knowledge there could be no reasonable Method prescrib'd for the Cure of Distempers in Trees, or for the renewing vigorous Growth in such as are decay'd: This is not only good in Theory, but is excellent in Practice, as I experienced in an Operation upon some old Dwarf Pear-Trees, that were reduced to so great Weakness that their Fruit, which should have weigh'd 9 or 10 Ounces a piece, was hardly bigger than Hazel Nuts: Some of the Trees were canker'd a little above the Roots, their Shoots were poor and sickly, and I had so little hopes of their Recovery, that I hardly thought it worth while to employ my Labour or Time about them; however, that I might not quite loose some of their Kinds in their Death, I contrived to inarch some of their best Branches into free Stocks, which I had by me at that Time in good Quantity.

About the End of *August*, I pick'd out of my Nursery about Fifty of the largest Pear Stocks I had, most of which were in the thickest Part two Thirds of an Inch Diameter;

ter; these I carefully transplanted at certain Distances from my sick Trees, contriving always to have every Stock within an easy Reach of one of the best Branches in my old Trees.

The Care I took in removing my Stocks gave them little or no Check, so that the following Spring I inarch'd several Branches of the old Trees into them; to one old Tree I had five Stocks, to another four, and some had only two a piece. Most of my inlay'd Grafts or inarched Shoots were perfectly joyn'd with the young Stocks in less than three Months; and as several of them blossom'd in the Spring, the Supply of good Juices from the young Stocks, which they were grafted into, so nourish'd the Fruit that set upon them, that I had several Pears even larger than I had observ'd before upon the old Trees when they were in Health; and the Branches of the old Trees nearest to every Stock strengthen'd themselves, as did also in Proportion every Part of the old Trees.

When the Fruit was fit to gather, I happen'd to be travelling, which was the Occasion that the inarch'd Cions were not then cut from the old Trees, but luckily remain'd all growing together. The following Year, to my surprize, the old Trees had got so much Vigour from the strong Juices of the young Stocks which circulated thro' them, that they had all the juvenile Appearance and healthful Disposition of a young Tree: They shot with so much strength, that I then began to fear they were in Danger of losing their

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their bearing Quality ; and therefore I saw'd the main Stem of one of the old Trees more than half thro', and drove a Wedge into the Wound, which yet did but little good in checking the Vigour of the Tree ; so that I was obliged to cut the old Tree entirely from its Root, leaving it only the young Stocks to feed on, which it did with so much Advantage that it grew well and produced good Fruit.

The other old Trees were all equally invigorated by this Practice, so that I was forced to cut off their Communication with some of the young Stocks, and thereby abridge their over Luxuriance, which is always an Hindrance to Bearing : By this Means the Trees became more gentle in their Vegetation, and disposed themselves to blossom and bear Fruit. But I saw many Inconveniencies which they would yet be subject to, by being treated in the Manner of Dwarfs ; as, that Pear-trees had three different Modes of giving us bearing Branches ; some Kinds would bear upon Wood of one Year, others of two Years, and others of three Years old, so that it was difficult to keep some of them in a regular Figure and expect Fruit from them ; and besides, that every Gardener was not either apprised of this in general, or else was not experienced in the Particulars, which sorts would blossom on one Year's, which on two Year's Shoots, &c. and to prune all alike would loose a great deal of Fruit.

Again I consider'd that the great spreading of these Dwarf-Trees did not only
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cover a great Quantity of Ground to little Purpose, but prevented the Earth about and under them from receiving the Benefit of the Sun's Heat, which was necessary for their Health and Support.

These Contemplations made me chuse rather to lay them in Espalier than suffer them any longer to remain Dwarfs, and accordingly I had Frames provided for that Purpose: In the laying of the Trees to the Frames, I was sometimes obliged to cut some of the most stubborn Branches half Way thro', that they might be brought with more Ease to spread upon the Frame; and this cutting had a very good Consequence, for the Trees receiv'd thereby such a Check in their vigorous Shooting, that brought them to a right bearing State; the Gardener had Opportunity of preserving proper Shoots of all sorts at their due Length, of maintaining proper Branches of all Kinds, so that there might be a continued Succession of good Fruit, and preserve the Trees from being too much incumber'd with it; for where a Tree is overpower'd with Fruit, it is subject to two grand Inconveniences, *viz.* the Fruit is always small, or it will not bear above once in three Years. So that, as I have remark'd in some of my former Writings, there must be a Succession of good Branches to afford us a Succession of good Fruit.

In the next Place, these Espaliers fill very little Space; and supposing the Dwarfs they were made from were planted in a Square at twelve Foot distance, when such Trees are lay'd into Espalier, there will be Spaces of
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Ground about ten Foot between every Row, which admits of Air and Sun enough to help the Trees and Fruit, and may be employ'd to some good Use: But it should be observ'd in the contriving such Espaliers, that they rather run East and West, that the South Sun may come full upon them.

Again, we have this Advantage from the Method I have here prescribed, that as the young grafted Parts of the Trees spread themselves, we may take off by degrees the older Parts, and at length have our Espalier quite fill'd from the Wood of the young Plants; and when they come to decay, restore them again by the same Method.

Another Way of assisting decay'd Trees is by opening their Roots, and laying about them the Intrails of Animals, or the Animals themselves. I have done this in several of the Summer Months with great Success, but especially the Month of *June* is the best Time, about the 20th Day, for then the Trees are preparing to make new Roots. It must be observ'd likewise, that the laying of fresh Earth to the Roots of Trees should be done about the same Time, and also we must be sure to enrich the Earth among old Dwarf-Trees before we plant our young Stocks near 'em for inarching; for the old Trees must certainly have impoverish'd the Land where they have long been growing, and the Stocks being of the same Kind would want Nourishment. But if by enriching the Ground about Trees we find them to grow over luxuriant, so that they leave bearing, then I would prescribe a Method which has been

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successfully

successfully practis'd by Mr. *Thomas Fairchild*.

In *February*, he advises to lay open the Roots, and cut off close by the Stem some of the largest Roots with a sharp Chissel, and throw in the Earth as soon as that Operation is over; by which Means the Tree will be sufficiently hindered from an Over-flux of raw Sap, and incline it to digest and ripen that which it already possesses, and so dispose it for framing Buds for Blossom.

But when a Tree is thus disposed for Bearing, we are to guard against many Accidents, as Blights, frosty Dews, Rains falling upon the Blossoms, and Dale Mists. To prevent Blights, I have already given some Directions in my former Works; and to prevent Injuries by frosty Dews falling upon the Blossoms, the Reverend and Curious Mr. *Laurence* has prescrib'd a Method in his Books of Gardening: And I find such Advantage by defending the blossoming Trees from the wet, that I am perswaded that even Glass Frames to be placed over some of the best sorts, when they are in Flower, would soon pay the Expence; for where this is practis'd, as at Mr. *Miller's* at *North End*, near *Fulham*, there is hardly one Blossom misses setting for Fruit; and I observe that when a Tree is exposed to the Weather, so that the Rain wets the Blossoms before they set, there is seldom any Fruit. I suppose the Rain, in this Case, prevents the flying about of the *farrina fecundans* or impregnating Dust, according to the Syslem of the Generation of Plants, so that it cannot perform its Office of setting the Fruit, or in other Terms to light

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light upon or enter the Uterus of the Blossoms. The Defence against *Dale Mists* is yet to be consider'd ; but their ill Effects are curiously describ'd in a Letter to me from the Reverend Mr. *Laurence*, which I shall insert for the Information of my Readers.

To Mr. BRADLEY, &c.

Dear SIR,

I Suppose by this Time you are returned to *Cambden-house* out of the West, from whence I received your very kind and obliging Letter: And as I was willing to take the first Opportunity to return you Thanks for it, so I could not but give you the History of a Misfortune I have met with, because I know you will sympathize with me in my Grief. On *May-Day* last, in the Morning, I had the melancholly Sight to behold all my tender Fruit (that was not more than ordinarily guarded with Shelters) ruin'd and destroy'd, by one of those *Dale Mists*, attended with a Frost, which I have described in my Second Part. Till then I never had a more hopeful Prospect of Fruit in my Life: But my Standard and Dwarf Cherries and Plums of all the best Sorts are, I think, totally destroy'd ; and such Shoots of my Vines as projected 3 or 4 Inches from the Wall were also all cut off with their Fruit. The tender Shoots of Hollies, Walnuts, Mulberries, and Ashes were all killed. Apricots and Peaches escaped pretty well, because they were guarded with Leaves. My Trouble and Sorrow

for this Loss is the greater, because so near me as the Church, which is little more than a Stone's Cast off, on a rising Ground, none of this Mischief happened; but all the Vales round about me have been affected with it more or less. I much fear a Blister on my Pear Leaves, and then my Fruit will be again endangered. How happy are they that are out of the Reach of these Misfortunes? And why should I love a Garden in this untoward Place? But my Religion forbids me to envy others; and so I am contented.

P. S. It is worth observing, that the Night preceeding that of my Losses, was attended with a much sharper Frost, and thick Ice; which yet, because there was a fresh Air and clear Sky, did no manner of harm as I could perceive; which confirms the Observation I formerly made, that the Hoar Frosts in Spring and Autumn are the most dangerous Enemies. Dry Frosts are not so bad as wet Ones.

*I am, with great Sincerity,
Your most Obliged Humble Servant,*

Yelvertoft,
May 6th,
1718.

J. LAURENCE.

To prevent the Disorders which may happen by most of the foregoing Accidents, when Trees are in Blossom; the curious *Mr. Greening*, Nursery-Man at *Brentford*, contrives to plant most kinds of Fruit in Espalier, and designs to prepare portable Reed Hedges
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in Frames to place as well at the Back as in the Front of his Espaliers, as he sees Occasion, so that the Trees cannot easily receive any harm either from blighting Winds or Rain, for these Frames may be set so close to the Espaliers, that the Rain cannot get at the Blossoms to wet them; for Rain, when the Air has any Motion, cannot fall exactly downright: Somewhat like this is the sort of Framing which I have mention'd in my *New Improvements*.

At the same Place I have remark'd an ingenious Method of pruning Figs against Walls, which make those bear well that bring one Crop in a Year, and forward the ripening the second Crops of the early sorts, which bear twice in a Year: About the End of *July*, the late bearing Fig-Trees are commonly in their shoot, in order to put out their Autumn Fruit; it is then advisable to break off their tender Tops so far as to leave only 3 or 4 Buds of the green Shoot, by which Means we may expect that that which is left growing will put out a young Shoot at every Bud, in order for Fruiting the following Spring; and this Method will also prevent the putting out the Autumn Fruit, which draw the Nourishment of the Tree to no Purpose. The early bearing Sorts at the same Time shew their second Crop, and this topping the green Shoots occasions the young growing Fruit to come speedily to Perfection, and ripen soon in the Autumn, as I have seen some Trees do more than once; but I shall take another Opportunity to treat at large upon the Varieties and Method of cultivating

tivating this delicious Fruit, the right Way of its Management being hitherto but very little known.

I shall proceed to give my Reader an Account of Artificial Heats, some of which are now in Practice; and for the others I suppose they may be cultivated to good Advantage in Husbandry and Gardening.

The Use of hot Beds, as they are generally made by our Gardeners, is almost every where in *Europe* practised in the same Manner, but not always with the same Success, for want of certain Regulators to indicate to the several Makers the just Degrees of Heat necessary for their various Uses: To bring therefore the Temper of such Beds to a Certainty, and to give us the Degree of Heat we desire, we must have recourse to a Thermometer, whereby we may try the Heat of the Beds or Stoves, whether it be equal to that of the Climate we are to imitate; which we may know by the sinking or rising of the Spirit in the Glass set in the hot Bed, and comparing its Height with what has been observ'd by such a Thermometer in the hottest Season of the Climate we receive each respective Plant from.

In the Case of hot Beds for Cucumbers, we must observe that the Beds have Heat enough to raise the Spirit in our Glass to the same Height which the Heat of the Weather would do with us in the End of *May* and *June*, when Cucumbers will grow Abroad without Artificial Heat or Shelter, and then we shall have a Certainty of the well-doing

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of such Plants, by giving them a Degree of Heat natural to them: In order to which Regulation I have procured the Favour of extracting necessary Remarks of the Degrees of Heat, and of the Temper of the Air, during the Space of the last three Years, from a most accurate Account observ'd and directed to be compiled by the Honourable *S. Molyneux*, Esq; *F. R. S.* from whence we may learn exactly how much Heat is necessary for every Kind of Plant we design to cultivate; which Extract, with the Explanation of the Thermometer and Barometer, for the Use of my less Learned Readers I shall insert, with Figures, in some of these Monthly Papers.

Besides the hot Bed I have mention'd, which is commonly made of Horse-Litter, there is another sort frequently used in *Holland* made of Tanners Bark, which when it is rightly prepared will maintain a Heat for six or seven Months: One of the best Examples in *England* of this sort of Bed is now practised by Mr. , Gardener to

Sir *Matthew Decker* at *Richmond*, for the propagating of the Ananas or Pine Apple, which being a Native of the hottest Climate, has never been propagated or brought to Perfection in *Europe*, till of late Years Mr. *Le Cour* of *Leyden* found out their Way of Management with so much Judgment, that he has seldom fewer than six or seven hundred Plants in a Summer, which bring perfect ripe Fruit. To this Gentleman's curious Discovery we are at present obliged; for by imitating his Method of cultivating this delicious Fruit, we find there are like to ripen forty Fruit-Trees
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this Autumn in the Garden at *Richmond*, which I have mention'd above; and I doubt not but in a few Years we shall find them in like Perfection in many of our *English* Gardens, as well as the *Branana's*, *Guava's*, and other Rich Fruits of the hotter Countries; which will certainly come to Perfection and ripen with us, by the same Method of Management that brings the Pine Apples to bear: But I shall defer the Particulars relating to the Culture of the *Ananas* till I have gone thro' the Artificial Heats and Conservatories I have promis'd to describe.

The next sort of Heat of this Kind, is produced by Bran and Water, as I have already mention'd in some of my former Works; but since my first publishing of that Invention, which was originally the great Sir *Isaac Newton's*, I find it is of still greater Use in Gardening than I at first discovered. My first Tryal was with a Bushel of Bran only, but I have since made some further Proofs of its Use, by wetting about six Bushels at one Time, which I find will keep a better Heat for Flower-pots, and preserve its Warmth more constant, and for a longer Space than a single Bushel; but in this great Quantity, as well as in the single Bushel, we must from Time to Time make Holes on the Top, and pour in warm Water to keep up the Heat in the large Quantities of this Mixture: However it is to be observ'd, that the Pots must not be buried in the Bran, but only set 2 or 3 Inches in it, and even then to be encased in other Pots to prevent burning. For this sort of hot Bed we should have a Wooden

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Cafe made about four or five Foot long, two Foot and a half wide, and about two Foot and a half deep in the Front part, and the Back about three Foot deep, so that there may be a sloping for the Glasses which are to cover it, like the common Frames made for hot Beds; this Cafe may be so order'd with Wheels, that it may be made to move from Place to Place to meet the Sun at any Time of the Day. The Learned and Reverend Dr. Bennet has one of these Boxes for the Tryal of several useful Experiments. These are chiefly what Heats can be raised by Fermentation for the Use of Gardening, the others will be inserted in my next, with the Method of adapting them to Offices.

But there are many Places in *England* where it is difficult to come at a sufficient Quantity of the foregoing Materials for hot Beds, and in such a case an ingenious Gardener is curb'd in his Designs and Undertakings, and not only looses Credit, but perhaps the Opportunity of making many useful Experiments; we shall therefore relate what has been sometimes practised with tollerable Success, but I am perswaded may still be improved.

All Heat of hot Beds proceeds from Fermentation, and whatever Bodies will produce a Ferment will answer this Design: Grass if it is cut, and heap'd together when it is wet, will ferment to so great a degree as to melt Tin, as will all of the grassy Tribe: Straw of any sort if it is wet, and lay'd together in a great Body, especially when some Sea-Coal Ashes are mixt with it, will yield a considerable Heat in a few Days; and I

have seen hot Beds well regulated that have been made of these Ingredients, especially for the Seed Beds of Melons and Cucumbers.

Mr. *Whitmill*, a very ingenious Gardener at *Hoxton*, tells me, that he never uses any hot Beds but of this kind; and to view the Plants he raises by this Method will readily convince us, that such Beds are no way inferior to others. At the same Time he instructed me in an excellent Way for producing of Melons, which carries so much good Reason with it, that I am well assured it cannot fail of good Success.

When the Melon Plants are raised, and become fit to plant in Ridges, he chooses a Border under a South Wall to plant them in, without laying any Dung about their Roots; as the Plants grow, he advises the laying them gently against the Wall, and tacking them to it, or training them to run up some Frame that may be contiguous to it; when the Fruit sets, he directs a Tile with an Hole in it to be fasten'd to the Wall with a Staple to lay the Fruit upon, the Hole is design'd to keep the Fruit from too much wet, as the bringing the Fruit to the Wall is design'd for its better ripening; but to keep all from the Weather, we may use the Lights belonging to the hot Bed Frames, setting them sloping against the Wall; and I doubt not but the Fruit thus manag'd, will have a much higher Flavour, and ripen much better than those we order in the common Way, especially in a cold wet Season, such as we have had the two last Summers.

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That Melons are much better when they are propagated without Dung, we have had many Instances; Mr. *Jewers* at *Battersea* does it every Year, with great Success, and several others of my Acquaintance follow the same Practice with the like Advantage.

The Melon, Cucumber, and Gourds of all sorts, are framed by Nature for climbing, which their Claspers shew us. I once had a Row of Cucumber Plants, which grew near enough to some Goosberry Trees to reach them with their Claspers; they grew so luxuriant that in a few Weeks they cover'd the Bushes, and brought me much fairer Fruit than any I had upon the Ground. About the Middle of *August* I began to cover them at Night with Mats, and by that means I had Fruit without Spots till *October* following.

The long Gourd, and the Calabash, I have had much larger against a Wall than ever I could get them upon an hot Bed; I have had Fruit of the first that measured above a Yard long, and was always straight till the Point came near the Earth, and then it always turn'd; one of these Fruit weigh'd above Twenty Pounds, and yet was not supported by any Help but its own Claspers.

I remember about two Years ago Mr. *Lawrence*, Gardener to the Right Honourable the Countess of *Westmoreland*, at *Twittenham*, took the same Method of propagating a large kind of Pumpkin, and had the largest Fruit of the Sort that had ever been seen in *England*. From such Examples we may be pretty well satisfied that the planting of Melons against

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That Melons are much better when they are propagated without Dung, we have had many Instances; Mr. *Jewers* at *Battersea* does it every Year, with great Success, and several others of my Acquaintance follow the same Practice with the like Advantage.

The Melon, Cucumber, and Gourds of all sorts, are framed by Nature for climbing, which their Claspers shew us. I once had a Row of Cucumber Plants, which grew near enough to some Goosberry Trees to reach them with their Claspers; they grew so luxuriant that in a few Weeks they cover'd the Bushes, and brought me much fairer Fruit than any I had upon the Ground. About the Middle of *August* I began to cover them at Night with Mats, and by that means I had Fruit without Spots till *October* following.

The long Gourd, and the Calebash, I have had much larger against a Wall than ever I could get them upon an hot Bed; I have had Fruit of the first that measured above a Yard long, and was always straight till the Point came near the Earth, and then it always turn'd; one of these Fruit weigh'd above Twenty Pounds, and yet was not supported by any Help but its own Claspers.

I remember about two Years ago Mr. *Lawrence*, Gardener to the Right Honourable the Countess of *Westmoreland*, at *Twittenham*, took the same Method of propagating a large kind of Pumpion, and had the largest Fruit of the Sort that had ever been seen in *England*. From such Examples we may be pretty well satisfied that the planting of Melons against

Walls will have as good an effect as Peaches, Pears, or other late Fruits receive from Wall-planting.

But we may observe that in the Culture of the Gourd kind, whose Fruit is of the largest and heaviest sort; there is no need of Tiles, or any other Invention to support the Fruit; Nature has furnish'd the Vines with Strength sufficient to support their Fruit without Help; and I see no Reason why the same Nature should not give the same necessary Assistance to the Melon that she has done to the Gourd and the rest of her Productions; for in all the Observations I have made, I find an Uniformity and Harmony in all her Works. The Fruit of the Melon indeed will according to this Method hang down as the Fruit of the Gourds do, but we find that does not hinder the Growth of the Fruits, so that I see no Necessity of any Support; the Heat of the Wall will certainly contribute to the ripening, and the Fruit thus managed will be out of the common Danger of being twisted in its Stalk, which checks the Sap, and wounds those Vessels which convey the Nourishment to the Fruit, so that it cannot be half furnish'd before it ripens. I have seen this Year several good Crops of Melons, which have been utterly spoil'd by this Practice, some Stalks have been twisted seven or eight Times; but wherever this is observ'd, we may be assured the Melon's good for nothing.

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A Letter to George Singer, Esq; concerning the Education of a Gardener.

S I R,

I Receiv'd yours, dated *May* the 15th, and am strictly of your Opinion, that the bare publishing of Experiments in Husbandry and Gardening, can be but of little use to the Publick, unless they are cultivated and promoted by Ingenious and Skilful Men; I shall therefore take this Opportunity of submitting to your Judgment, some Prescriptions for the Education of those who design to profess or follow Agriculture or the Hortulan Arts, that those Studies which are of the most antient Date may not only be cultivated with new Vigour, but that the Practitioners as well as the Theorists may go Hand in Hand in the Improvement of our Lands.

Gardening and Husbandry are Sciences well becoming the greatest Philosophers, they have the pleasure of taming or civilizing the little Wildnesses of Nature, and by that Means of ordering her Works in such a Manner, as to make them become profitable and useful to our Interests; we are charm'd with her numberless Beauties, we recreate our Senses in the most innocent Manner, we preserve Health of Body, and I may add, we are free from noisy and impertinent Clamours, which daily present themselves in the hurried Part of the World; and if these Studies have the same Effect upon the Minds of others, that they have upon me, they do not a little contribute

contribute to set forth the Wisdom and Power of the Great *Creator*.

That I may therefore, good Sir, improve as much as possible, a Science which may be so useful and beneficial to Mankind, I am the more earnest to cultivate that kind of Learning in a Philosophical Way; that in time it may be further improv'd, and the Curious may find more judicial Operations among the Practicers and a Conversation becoming the Quality of that unbounded Study.

1. In order to this, I would first propose that only such as have a Natural Bent of Genius to this Study should ever be brought up to so difficult a Profession.

2. That where such a Person is found, he should be instructed in the *Latin* Tongue, Writing, Arithmetick, Mathematicks, and Designing.

3. That he should, in the unbusy'd Times of his Practice, acquaint himself with the Rules and Terms of Botany, so far as they may relate to classing or assorting Plants to their respective Tribes or Families, and to distinguish every sort by its proper Name.

4. To collect the several Sorts of Fruit, and keep Memorandums of their respective Characteristicks, and particularly observe the different Times of their ripening.

5. That he should observe the different Degrees of Heat, necessary to promote the Growth of Plants of different Climates, and know how to regulate those which he composes or uses Artificially.

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6. That he should take every convenient Opportunity of conversing with Ingenious Men, as well in the Art of Husbandry as Gardening, and to view their different Ways of Practice, by which he may learn the different Effects of different Soil, and Pruning or Planting, and gather to himself particular Knowledge from Variety of Observation. To finish a Man who has pass'd thro' these Paths of Study, let him Travel first to *Holland*, and from thence thro' *Flanders*, to *France*; such a Voyage, tho' it will give him but few valuable Particulars, yet will furnish him with some general Ideas, which may tend to his Improvement; he will see in *Holland* that the Study of Gardening is not unworthy the wisest and greatest Men in the Country, that it is not only us'd as a Recreation, but as a profitable Business: If he has used his Time well, he will meet with extraordinary Respect, and be encouraged to proceed in his Studies and the pursuit of Knowledge; for no People in the World have a greater Regard for Men of Understanding and Industry than the *Hollanders*; their Country is maintain'd by that Policy.

In *Flanders* the Gardens vary from the former, they are more after the *English* manner, but 'tis the best Passage to *France*, and may prepare the Mind to judge of the *French* Gardens, whose Value chiefly consists in the Management of Fruit Trees, *Versailles* excepted, which is the Sum of every Thing that has ever been done in the Gardening Way; *Trianon* and *Marly* are partly of the same Taste, and a Sight of them will furnish fine Ideas.

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I have so far answer'd your Desire, that I have sent the remaining part of my History of Succulent Plants to be printed; I expect the Third Decade will be ready for Publication about the End of the Month, and about the same Time shall reprint the First.

I am, S I R,

Yours, &c.



R. BRADLEY.

The End of the Month of JUNE.

A GENERAL
T R E A T I S E
O F

Husbandry and Gardening,

For the Month of *July*.

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improve-
ment of Land.

W I T H

An Account of such extraordinary In-
ventions, and natural Productions, as
may help the Ingenious in their Stu-
dies, and promote universal Learning.

*To be continu'd Monthly, with Variety of
curious CUTTS.*

By R. BRADLEY, *Fellow of the
Royal Society.*

L O N D O N:

Printed for J. PEELE, at Locke's Head, in
Pater-Noster-Row.

(Price One Shilling.)



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To the Honourable

JAMES JOHNSTONE,
of Twittenham, Esq;

S I R,



OUR Approbation
of the Method I
have taken in pub-
lishing monthly Ob-
servations and Ex-
periments in Agri-
culture and Gardening, gives me
Encouragement to hope Your fa-
A 2 your-

ii DEDICATION.

vourable Reception of the following Sheets.

The numerous Varieties which appear in every Part of Your fine Gardens, are so many shining Proofs of the great Judgment and extraordinary Skill of their able Master, and are as many useful Examples for the Instruction of the Curious.

The many Improvements in Gardens, which have sprung from Your excellent Genius, fill us continually with Pleasure and Admiration; that useful Discovery alone, of transplanting large Trees with Safety in the hottest Summer-Months, which the World owes to Your solid Thought and extensive Knowledge in the Works of Nature, very justly demands the Thanks and Esteem of every one, who has Reason and good Sense enough to
admire

DEDICATION. iii

admire an Art which extends to publick Good.

'Tis, I confess, one of the greatest Pleasures I enjoy, of having the Liberty of observing Your curious Discoveries, founded upon Philosophical Principles, where Reason gives the Success. Surely, Sir, whoever has an Opportunity of observing those Experiments which You continually direct, can never imagine that the Art of Gardening is limited; such Thoughts may be perhaps pleasant to a few faint Beginners, but the true Pleasure of this Study to the more knowing Part of Mankind is in observing, that every Day produces new Beauties and useful Matter, as is evident from Your continual Improvement.

That

iv DEDICATION.

That You may long enjoy the
Pleasure of improving this useful
Knowledge, and possess an unin-
terrupted Content, is the hearty
Wish of,

Honoured S I R,

Your most Obliged,

Humble Servant,

Richard Bradley.

E R R A T A.

- Page 186. Line 26. for *Lones* read *Cones*.
P. 187. l. 9. read *Wire Sive*.
P. 188. l. 1. read *Rake* for *Rakes*.
P. 200. l. 15. read *Edger* for *Edgers*.
P. 201. l. 15. read *with old* for *with the old*.
P. 202. l. 8. read *on* for *no*.
P. 204. l. 6. read *forget* for *forgot*.
P. 206. l. 26. read *pointed* for *painted*.
P. 207. l. 20. read *Eight* for *Twenty*.



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A GENERAL
TREATISE
OF
Husbandry and Gardening.



HIS Month begins my second Quarter, which is the richest in the whole Year. *July, August and September,* afford us the most valuable Fruits, and it is in those Months the Husbandmen and Gardeners reap the Reward of their Skill and Labour. Happy now are those who have acted with Wisdom, and have been careful to employ themselves with Diligence and Circumspection. The Spring was irregular ; the Summer cold, wet, and uncertain, and therefore the ingenious Gardener has had the greater Opportunity of showing his Skill; for when all Seasons concur to give us store of Fruit, the Gardener gains less Honour

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than when he has such Difficulties to encounter with, as he has met with this Year. I have been curious enough to observe many Seasons, and to take Journally an Account of whatever I found remarkable in Gardening or Agriculture, whether in *Britain*, or other Parts of *Europe*; from which Remarks I have been perswaded to take some few Observations, and publish them in this Monthly Manner. In the Course of Fifteen Years, that I have been a Lover of these Studies, any one may guess whether it is impossible to collect, not only Matter enough to supply an Undertaking of this Kind for a Twelvemonth, but more than ten Times as much; and especially in a Subject so vastly copious as Gardening or Agriculture. This I the rather mention, because some are of Opinion the Theme is exhausted, and that there is not Matter enough to work upon: But I find these Studies afford us infinite Varieties; the more we study them, the more we desire to know of them, and that we must have recourse to greater Thought and more experimental and extensive Knowledge, than what has hitherto been look'd upon as the *Ne plus*. In the Way of Gardening, I find that every Day produces something which we never observ'd before; in a Word, there is no End of Hortulan Improvements as long as Time shall last. But tho' some few are not of my Opinion, I find the greatest Part of my Correspondents join with me in the Thought, that these Studies ought to be cultivated as much as possible in the Minds of the People; that they are extensive, healthful and profitable;

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we see more of the Excellency of Nature, and have greater Opportunities of learning her Regularity and Accuracy, than in any Study whatever. There is not a Part of Natural History which this Study has not an Agreement and Harmony with ; which makes it necessary therefore, that such as would be Masters in Agriculture and Gardening, should consult Nature as much as possible ; and those who labour to improve the other Branches of Natural Knowledge, have the same Reason to inform themselves of the various Subjects in the Fields and Gardens.

And as Natural Knowledge is generally allow'd to be the Basis upon which every useful Art is founded, so it has been the Opinion of the greatest Men in every civiliz'd Nation, that a compleat Body of Natural History should be compiled, free from the Errors and gross Falshoods which have frequently slip'd into the Works of some of the Antients and their Followers : Such a Work, they observe, would be of excellent Use to the World, by furnishing us with just Ideas of Nature's Works, and thereby modelling the Minds of Men to a true Judgment of the Symmetry, Harmony, and Proportion each simple Part bears to all the rest ; from whence all our Designs and Undertakings in every sort of Learning may be regulated, and brought nearer to Perfection.

In order therefore, to compile so useful a Work, I am perswaded to do my Part to it, having already consulted the most celebrated Cabinets in *Europe*, and the Observations of the most learned Societies ; so that I have already

ready a large Fund of Matter provided for such an Undertaking, especially in that Part of Natural History which relates to a Body of Husbandry ; in which I propose to give, in the 1st Place, the entire Anatomy of one Plant. 2dly, To make a Comparison between the several Methods now practis'd, of assorting or classing of Plants, from Mr. Ray and *Tournefort*. 3dly, To give an Account of all the Capital Experiments which have been made, relating to Plants, by the Royal Society, Royal Academy of *Paris*, and other learned *European* Societies, or particular *Virtuosi* ; with such other Curiosities as may render a Body of Husbandry as compleat as possible. For other Branches of this sort of Learning, I shall leave them to those Persons who make it their proper Business to study them ; and if among my Papers I have any Thing which may be of Use to them in their Ways of Study, I shall be ready to communicate to them what they desire, as I expect the same Favour from them in my Way ; and I doubt not but such a Work will meet with sufficient Encouragement.

But I proceed to describe such Inventions as are now in Use, or may be practis'd with Success for the forwarding of Fruits and Flowers, and the Preservation of Exotick Plants, by Means of Fire, according to my Promise in the preceding Month.

In my Observations for the Month of *June*, I hinted at those artificial Heats for the Use of Gardeners, which are occasion'd by Fermentation, and promis'd the Description of some new invented Stoves or Conservatories

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servatories for the Preservation of Plants in the Winter. The first I shall mention is a Contrivance for forwarding the Ripening of Grapes, and is likewise useful for preserving some of the less tender Exoticks. This indeed is somewhat vary'd according to the Humour of the Architect ; but I think all those Variations are nearly alike successful.

Fig. I. is the Ground Plat of a Wall, built Semicircular in Sweeps, each Sweep measuring eight Foot over AAAA ; at the Back of this are two Ovens BB, which are each four Foot long, and three Foot broad, before they open into the Flues CCC ; the Flues at the Back of the Wall are two Foot over, and as much in height : When they come to turn at the Corners they are reduc'd to a Foot wide, and rise gently to convey the Draught of Smoak and Heat into the Flue C, which runs in the Front of the Niches, to be carry'd up the Chimney D. On the Top of this Front Flue are set the Pannels of Glass, which slope gently towards the Top of the Wall, where they meet a Coping ; in the Middle of every Nich a Vine should be planted to be order'd as I shall direct hereafter.

Fig. II. is the Upright of the same Wall, made to front the South Sun, which must be observ'd in all the other Walls built for this Purpose.

Fig. III. is the Ground Plat of Wall built in Niches, in the Figure of half an Hexagon, each Nich eight Foot over AAAA. At the Back of the first Nich is an Oven or Fire-place three or four Foot Square, mark'd B. opening into a Flue B. of two Foot high, and

and a Foot and half over, reaching about two Foot and half high in the Wall : At the End of this Flue, where it enters the Chimney, about four Foot high of the Wall, is another Oven or Fire place as large as the former, mark'd C, which opens into a Flue C, which is of the same Dimension of the Flue B. and runs over or above, and parallel with it.

This Front is glaz'd and planted like the former ; the Niches of both are very proper for preserving Cabbage-Lettice in the Winter, and for young Sallads ; when the Fires begin to work, we may likewise put in Kidney-Beans, or some Dwarf Pease ; but I shall say more of these Things by and by.

The next Stove or Conservatory I shall take Notice of, is That lately built by Mr. *Fairchild* at *Hoxton*, which is contriv'd for several good Uses ; and among others I am of Opinion it will bring the Ananas or Pine Apple to bear Fruit ; 'tis ten or twelve Foot wide from the Front Glasses to the Back Wall, and about forty Foot in Length ; the front Frame to which the Glasses are hing'd, lie sloping to the Back in such a Manner, as to drop about a Foot from an Upright, and the Roof or Ceiling is higher in the Front about a Foot than it is at the Back Wall ; the fire Place or Oven is about three Foot square, mark'd A. Fig. IV. About a Foot high this Oven opens into three Flues mark'd BBB. running parallel to one another to C. the whole Length of the House. At C they are all resolv'd into one Flue, which in the Breadth of the House to D rises about three Foot higher, and then runs through a Flue E

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to the Chimney F, which gives a Draught to the Whole, and a due Degree of Heat every where.

The Flue E is cover'd with square Tiles, and is the uppermost of four Steps for the standing of Pots: Between the Steps and the Front Flues BBB is a Walk about three Foot wide, laid with Sand, which preserves an Heat when the Fire is out.

The three Flues mark'd BBB are cover'd with square Tiles, so disposed, that a Bed of Sand of a Foot thick may lie upon them; into which some Pots with the most tender Plants are to be set; and such a Sand-Heat is accounted the most constant of any other, and may be regulated to any Degree of Heat, by adding or taking away of Sand.

Over the Fire-Place A are three Pipes of Earth, about three Inches each in the Bore, which being heated, let into the Conservatory an Air duly warm, and prevent the Damps and Stagnation of Air in the House; and near the same Fire-Place is placed an Earthen Pipe, which conveys hot Air at Discretion into a Glass Frame mark'd HHHH by G, which is the Front Wall of the Conservatory I have been describing. This Front Wall is about two Foot high, upon which the great Glass Frames of the Conservatory are rested. This Wall mark'd GG is heated by the Fire in the Flues, and is contriv'd so as to make the Back of the Frames mark'd HH communicate a gentle Warmth to them.

Against this Wall from G to G are to be planted some of the common *May* Cherries, which are slow Growers; and tho' the Wall

may not be in the Clear above twenty Inches high from the Surface of the Bed, yet by leading the Shoots of such Trees horizontally, the Trees will have full Room enough to grow and bear Fruit.

Upon the Bed, or in the Frame mark'd HHHH and III, may be planted Tulips, Narcissus, Jonquils, Hyacinths; and towards the Front, which is the shallowest Part, Crocus's and Winter Aconites, to come about Christmas. The Bed HH, &c. will bring its Flowers perhaps a Month sooner than that mark'd III, proportionable to the Distance from the Fire-place. At the End of the Bed mark'd II, &c. is an Earthen Pipe to let warm Air out of the Conservatory into the little Frame, in case of extraordinary Frost. The Figures 1, 2, 3, are so many Steps cover'd with square Tiles without Flues under them, for the Pots of less tender exotick Plants; such as Aloes, and others, which come from Places from 25 to 35 Degrees Latitude: But the Bed of Sand BBB will be hot enough for Plants from 25 Degrees Latitude to the Line. The Door Way is at K, which opens from another House into the Conservatory; so that the Air which enters it upon opening the Door is never overcool, but is soften'd by the Warmth of the Fire-place. An House of this kind may be divided by a Partition of Glass; for any Thing less transparent would occasion too great a Shade in both Divisions, at the very Seasons when the Sun's Presence is most necessary.

The Use of the Partition is, that we may give Air to the Plants in one Division, when
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we give none to the Other ; for the Plants in One should be only such as come from Places of Northern Latitude, and the Others of South Latitude, which always have different Seasons of Growth, as their Natural Spring happens either in this or the other Side the Line ; and we ought to humour our Plants, and encourage their shooting, only at such Times as it is natural for them to grow.

In some Stoves or Conservatories, the Fire-place is a kind of Oven cover'd with Plates of Cast Iron, so that the Space of the Oven is about ten Foot in Length, and five in Breadth, and the Flue leading from it runs parallel with the Back of the House, and then taking a Turn runs along the Front, just within the Glasses, ending in a Chimny that passes through the End Wall: This Flue is about fourteen Inches wide, and about eighteen in Depth, and is cover'd with Iron Plates of about two Foot in Length: Over the Whole is laid a Covering of Sand of three or four Inches thick, and upon that a Pavement of square Tiles. A Stove or Conservatory thus prepar'd for giving Heat, may be about fifty Foot in Length, ten Foot wide, and ten Foot high in the Back Wall from the Floor, and should always have a Door or two opening into some other House or Room to let in regulated or corrected Air, when the Heat is too intense ; for Air may be too much rarified or refined by Heat for a Plant to live in, as it may be for an Animal to live in : For want of this Caution I have known Plants have changed their healthful Verdure for a pale, sickly Colour, which has ended

in Death ; and I am perswaded many a Man has grown sickly for want of a due Freedom of breathing a well regulated Air, which I am satisfy'd may be render'd more or less agreeable to our Constitutions by Art.

The Fires to be used in these Stoves or Furnaces are either Wood, Coal, Turf, or Peat.

The first is sudden and unconstant, affording a much hotter Smoak than either of the others, and therefore is the best for warming the Walls, for forwarding of Grapes and other Fruits, where the Flues are of great Length.

The Coal yields a more lasting Heat, and affords a Smoak of a moderate Warmth, and may do well enough to warm Flues of a moderate Length : But Turf or Peat, such as they burn in *Holland*, gives us a constant equal Heat, and yields no perceptible Smoak ; it warms the Air in the Flues, and never disturbs Plants ; and where this is burnt, there must always be a much larger Oven to gather a Fund of Heat than when we burn Wood or Coal ; and where such Ovens or Fire-places are large, and cover'd with Iron, we may cover their Pavement or Floors with Sea Sand, four, five or six Inches thick, to regulate the Heat, and give an agreeable Dew to the Plants, in Imitation of what they would meet with Abroad.

I would not have my Readers mistake this Dew, for a Damp which often rises in green Houses ; that Damp proceeds from a moist stagnating Air. The Dew I speak of, is a gentle circulative Air, fill'd with vegetative Salts, such as nourish Plants ; but the Damp destroys them.

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I have sometimes thought, that if it was possible to have a Room built adjoining to a Glass-house, and to have its Windows face the South, that in such a Place one might cultivate the most tender Plants without great Expence ; for the continued Fire in the Glass-house might be contriv'd to keep the Air in the Room adjoining, of a constant Warmth, equally the same Day and Night, and might also be of excellent Use in some Chymical Preparations ; for the Glass-house Fire burns for many Years without Intermiſſion: But was a private Person to maintain such a Fire at his own Expence only to try Experiments, it would be vastly troublesome, and hardly *quit Cost* ; but I offer this as a Hint worth improving by the Curious, who can have Opportunities of building a Laboratory or a Conservatory for raising of Plants, to have a Communication with the Furnace of a Glass-house. I suppose by such Means, as well as by the Stoves I have described, we might ripen the famous Fruit call'd the *Ananas*, and raise Plants of Cucumbers and Melons at any Time in the Winter ; and the *Bananas*, *Guavas*, and other *West-Indian* Fruit, as well as the *Mango* of the *East-Indies*, would doubtless grow very well in such warm Places ; and not only appear very beautiful, but bring us excellent Fruit in full Ripeness. The late Dutchess of *Beaufort*, whose Memory will ever be grateful to the learned Part of the World, had several *Guavas* ripen'd at *Badminton*, even with less Heat than may be produc'd in the Stoves I have mention'd : And I can venture to affirm, it was from her
Grace's

Grace's excellent Judgment, and Delight in Botanical Affairs, that we are chiefly oblig'd for the present Splendor, Ornament and Richness of our *British* Gardens; the great Advantages of Health, and Peace of Mind which attended this kind of Science, soon made an Impression upon the greatest and most learn'd Men in the Nation. I am told, that soon after her Grace had set the Example, it became the Study of the learned Lord *Capel*, Sir *William Temple*, the late Bishop of *London* and Mr. *Evelin*, whose Vigilance and Industry in this Philosophical Diversion, brought Gardening to so great a Perfection, that it afterwards became not only a general Entertainment, but a Publick Benefit. So much has the Study of this Art encreas'd since the *Revolution*, about which Time these great Personages began it, that, as I am inform'd, there were then only ten thousand Acres of Ground employ'd in Gardens for the Use of the *London* Markets, and now there are computed about one hundred and ten thousand Acres cultivated for the same Purpose.

And I am in hopes, from the Number of my Correspondents, that this useful Science will more and more encrease, and become the Delight of the People. The following ingenious Letter I receiv'd from a Gentleman of great Curiosity and Ability, relating to the propagating the *Firr* Tree; and I am perswaded it will be acceptable to my Countrymen, whose Interest he studies to advance with a Spirit truly noble.

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To Mr. BRADLEY.

SIR,

I Have been, for many Years, a profess'd
' Lover of Husbandry, as I think it not
' only the most innocent, and most health-
' ful Amusement in the World; but what, if
' rightly follow'd, may be of great Profit
' to particular Persons, and of Advantage to
' the Publick. As I design to be a constant
' Correspondent of yours, I shall not trouble
' you at this Time with my Opinion of the
' Authors that have writ upon this Science,
' nor with the Success or Disappointments I
' have met with in the Experiments I have
' try'd: But since I think you design the Good
' of your Country, you ought not only to
' meet with all Encouragement, but with all
' Assistance from the Experience of others;
' so without further Introduction, I shall make
' the Firr Tree the Subject of this Letter,
' which is (for what I can see) very much
' a Stranger to *England*. I am a *North Bri-*
' *tain*, and have seen their Way of managing
' them there, where they not only have great
' Woods of them, that grow naturally upon
' Mountains, and (as I am told) are fit for
' Masts to the largest Ships; but our Gen-
' tlemen have of late Years made great Plan-
' tations of them: At first they were fond of
' them, because of their keeping their Leaves
' all Winter, and being continually green;
' but as they loose much of their Beauty
' when they pass twenty Years old, especial-
' ly

' ly with the unmerciful pruning that was
 ' then in Use, which made them top-heavy,
 ' and so yielded to the Wind, even to the
 ' breaking them over some times; but always
 ' the uttermost Rows were crooked. At last
 ' Gentlemen came to plant them at a fargreat-
 ' er Distance from their Houses, where their
 ' Colour made a fine Show through the whole
 ' Year, and the rugged Bark was not so easi-
 ' ly seen; so that now there are, for the most
 ' Part, Thickets of other Trees betwixt the
 ' House and the Firrs; and indeed I would
 ' advise a good Thicket of Firrs to be plan-
 ' ted round any Place where you would wish
 ' to have your other Trees thrive well. Con-
 ' sider, Sir, that I am speaking of *Scotland*,
 ' where our Winds are more frequent and
 ' violent than in *England*: So that was any
 ' Body to begin a Plantation, I would ad-
 ' vise them to plant round the Field a good
 ' Number of Firrs, even before he sowed a
 ' Seed of what we call Grey Timber; and
 ' these ordered (as I hope to shew you) I dare
 ' say will give such Shelter to the rest, as will
 ' much advance their Growth. I shall now
 ' begin with the gathering the Lones, Clogs,
 ' or Apples, for these are the Names that we
 ' have for them: They are fit for pulling in
 ' *January* or *February*; if they hang upon the
 ' Trees till the Frosts are over, the first Sun-
 ' shine opens them, and then the Seed is lost:
 ' We are at no Difficulty in getting of them
 ' now, because there is scarce a Gentleman's
 ' House where there are not Firr Trees; but
 ' some Time ago all the Planters were in a
 ' great deal of Hurry to get the Clogs open'd,
 ' that

' that so the Seed might be got ready by the
 ' End of *March*, or beginning of *April*; and
 ' our Weather not answering some Years, dis-
 ' appointed the Planters extremely, so that
 ' I have seen the Clogs put under hot-bed
 ' Glasses; others laid them at a Distance be-
 ' fore a Fire, and had People always by to
 ' turn them, and every five Minutes to sift the
 ' Clogs with a Wire to get out the Seed;
 ' these Ways did pretty well, but were trou-
 ' blefome, and the last Way dangerous; o-
 ' thers put them in an Oven, or upon a Kiln,
 ' but these two last Ways were errant Cheats,
 ' since the Seed was overdry'd, so that they
 ' proved good for nothing. At last an old
 ' Gardener, who long had dealt in Firr Seed,
 ' made an Experiment, *viz.* he gather'd the
 ' Clogs at the ordinary Time, laid them up
 ' in a cool dry Place, where they got neither
 ' Moisture nor the Heat of the Sun, till the
 ' End of *July*, or beginning of *August*; at
 ' which Time he laid them out to the Sun,
 ' by which Means they opened more in one
 ' Day, and a great deal kindlier, than what
 ' could be done in a Month any other Way;
 ' the Seed he carefully kept in a dry cool Room,
 ' and then in the Spring he had the command
 ' of sowing it what Time he pleas'd, as the
 ' Spring was later or forwarder. You see by
 ' this Method it would be no difficult Mat-
 ' ter for the Timber Merchants to bring the
 ' Clogs from *Norway*, tho' we having the Tree
 ' amongst our selves are not at that Trouble.
 ' The best Way of sowing them, is in ordi-
 ' nary Ground of Natural Earth, not forc'd
 ' nor poor, the Earth turn'd off with the Back

of the Rakes till the Seed is sown, which
 must be done pretty thick ; then the Earth
 drawn on again, and rak'd very gently till
 the Seed is all cover'd : Some Days after-
 wards it will not be amiss to sift upon the
 Beds some more Mould, free of Stones or
 Gravel : Your Correspondent Mr. *Waller's*
 Frames are not only a good, but I think a
 necessary Way, since the Frames in a few
 Years will be much cheaper than hiring Men
 to chase away the small Birds (especially
 the Gold-finch) from the Beds, who are so
 greedy of the Seed, that if it is not guard-
 ed, your Nursery will soon be pick'd up.
 Before Winter comes on, it is absolutely fit
 to throw some Saw Dust, Chaff, or some-
 thing of that kind upon your young Plants,
 to preserve them from the Frost, which o-
 therwise would swell the Ground, and so
 spew them up. In *Scotland* they used Coal
 Ashes, which I thought too hot, and rather
 chused the other Way. If the Seed has been
 good, and sown thick enough, there will be
 no Occasion to weed the Beds the next Year;
 if it has not, they must be weeded, but very
 carefully, lest the young Plants be pulled
 up. When they have been two Years in the
 Ground, from the Sowing; for Example,
 from the End of *March*, 1721. to the End
 of *March* 1723, they must be remov'd. In
 our Country it was the Custom to put them
 in Nursery Ground, at about a Foot's Dis-
 tance, where they were to be kept clean from
 Grass Weeds, &c. for two Years more, and
 some have kept them a great deal longer,
 tho' I think with very little Success, which
 was

' was both troublesome and expensive ; but
 ' some Gentlemen made Tryals of removing
 ' them from the Seed Bed to the Place where
 ' they design'd they should always stand.
 ' Their Method was this : Having got the
 ' Pits ready, with the Earth fill'd in, they drew
 ' as many young Firrs as they thought they
 ' would be able to plant in a Day ; the Roots
 ' of these they dip in a Tub of Earth and
 ' Water mix'd together till it be pretty thick,
 ' and lay a handful of this Pap upon the
 ' Roots, to keep the Air from drying them ;
 ' one Man can carry a great many in a Bas-
 ' ket: When they come to the Pits, they plant
 ' them with a Dibble. They found by this
 ' Practice, that fewer Firrs misgave than when
 ' they were put in Nursery ; and you may
 ' judge what Trouble and Expence was sa-
 ' ved. At the same Time, I must tell you,
 ' that now very few Firrs are planted with
 ' us, except it is in heathy, poor, sandy, gra-
 ' velly, or rocky Ground, where nothing else
 ' is likely to grow ; if they are planted in
 ' richer Soil, either for their Beauty, or to be
 ' a shelter to other Trees, they must be weed-
 ' ed : But as I am resolv'd to treat in another
 ' Letter, of the Benefit they may be to other
 ' Plantings, I shall say nothing of that here, but
 ' proceed to give you an Account how we use
 ' them in our poor Grounds, where Weeding
 ' is altogether needless ; and by the by, I
 ' must acquaint you, that a Firr will, in a poor
 ' hungry Soil, grow as fast, and I believe bet-
 ' ter Wood, than in a richer Mould. The
 ' Way I would chuse to plant them is at four
 ' Feet's distance, without attempting any Re-
 ' gularity,

' gularity, since I think them only fit for
 ' Thickers, and not for Walks. I do not be-
 ' lieve that they will ever come to be great
 ' Trees, if they are allowed to stand thus thick;
 ' but this I know, that when they are planted
 ' close, they help each other to grow. When
 ' they grow troublesome by their Nearness, it
 ' is easy to prune Branches from some of them,
 ' which will give Air, by degrees, to the rest;
 ' and doing this yearly, you may cut down
 ' some of them as you see Occasion: But I
 ' would not chuse to prune a Firr that I de-
 ' sign'd for Timber, since our best and only
 ' Firr Timber comes from Countries, where
 ' I dare say they never were touch'd with Iron,
 ' till they were felled: And I reckon, the Rea-
 ' son that makes the Timber that Gentlemen
 ' cut down so full of Knots, is the Pruning;
 ' for if Firrs are let grow close together, the
 ' great Boughs in Time grow smaller by want
 ' of Air or Nourishment: So that I have re-
 ' mark'd a low Bough as big as my Leg wi-
 ' ther till it grew as small as my Finger, and
 ' then drop off; so that I believe, by this
 ' Means, the great Knots will not be found
 ' in these Trees, when they are cut down. I
 ' have now in a superficial Way given you my
 ' Opinion as to the Method of propagating
 ' this Tree, which I am sorry to see so little
 ' Regard had to in this Country, considering
 ' it is so easy to be had, and there is no
 ' Ground so barren in which they will not
 ' thrive; they are green all the Year, and how
 ' much Demand there is for that Timber from
 ' Abroad is pretty well known: So that I have
 ' been surpriz'd to see such wild Wastes where
 ' these

' these Trees, (if they had not been despis'd)
 ' might have now made a fine Figure, and
 ' been of great Profit to the Country. But
 ' since you are upon a Design to show your
 ' Fellow-Subjects the Way of being innocent-
 ' ly rich, without dangerous Schemes, I
 ' thought it my Duty, as a *Briton*, to tell you
 ' what I know ; and though this Account
 ' may be very imperfect, yet I hope after-
 ' wards to make it up, by adding any thing
 ' I may have forgot, or any new Experiment.
 ' If my Brother Planters find Fault with what
 ' I have said, I shall either own my Mistake,
 ' or give my Reasons for my Assertions. I
 ' hope none of your Correspondents will take
 ' it amiss, if in the Course of my Letters to
 ' you, I differ from them in some Things ;
 ' but I shall not insist upon any thing of this
 ' kind now, having, I'm afraid, been too te-
 ' dious already. I shun'd using any hard
 ' Words, because I think, in such a Business,
 ' the plainer a Man is, the better ; and it is
 ' rather to Gardeners than Philosophers, that
 ' the drudging Parts of Planting belong. I
 ' hope no Body will find Fault with me for
 ' recommending a different Method than any
 ' I have yet met with in Authors upon this
 ' Head : But this I am sure of, that I have
 ' seen the Way I have set down follow'd with
 ' great Success. As to the new Way of Planting
 ' large Trees, and even Firrs in the Middle
 ' of Summer, I have seen it at a Gentle-
 ' man's whom you will always have Occa-
 ' sion to mention with Esteem ; tho' I think it
 ' is fittest to be practis'd where one is in haste
 ' to have a Garden, or a sudden Plantation :
 ' But

' But as what I have been writing about is
 ' for much larger Designs, and of a Tree
 ' that will not in many Years be worth the
 ' Money and Labour that it will cost in
 ' the transplanting if big: For, in great Pro-
 ' jects, where Profit as well as Pleasure is
 ' aim'd at, the saving of Money is to be re-
 ' garded; and I can see no way of doing
 ' this but by planting young Trees: And in-
 ' deed, I am not sure but a Firr Tree of two
 ' Years old, planted as I have told you, may
 ' in Forty Years be of as great Stature and
 ' Value, as one transplanted of Fifteen at
 ' the End of that Time. I hope I shall have
 ' Occasion after this, to write upon several
 ' other Heads, and hope your Correspondents
 ' will encrease. For my part, I shall advance
 ' nothing but Matters of Fact, since I think
 ' no Man of Honour would impose upon
 ' one that wishes so well to his Country, as
 ' I dare say you do.

I am, SIR,
 Your most humble Servant,
 JOHN EDENBRUGH.

This Letter gives us an ingenious Account
 of the Method of Planting the Firr, which
 is a Tree that has hitherto been little under-
 stood in the South Parts of *Britain*; and I
 hope it will be a Means of propagating that
 useful Plant among us, and of employing
 some of those Lands, which, till lately, have
 been accounted the most unprofitable: But as
 a further Correspondence with the curious
 Author, may give us Opportunities of reap-
 ing still more Benefits from it than he has
 men-

mention'd in this Letter, I shall hope for an early Supply from him for my Readers Benefit.

The following Letter relates to the Analogy of the Circulation of Juices in Plants and Animals, and terminates in a Parallel between the Method of inoculating the Small-Pox on humane Bodies, and the Method I have lately practis'd to infuse Morbid Juices into healthful Plants, so as to make them become distemper'd.

To Dr. Douglass, F. R. S. in Bow-Lane, London.

S I R,

THE *Turkish* Method, which has been lately brought into *England*, of inoculating the Small-Pox, has furnish'd me with many Hints which tend to the further Discovery of the Circulation of Sap in Plants.

I have, in many of my Writings, given Instances of the Analogy between Animals and Vegetables, and have as often brought Experiments to confirm the Sap's Circulation, and the Generation of Plants; both which Discoveries, the more we know of them, the more it is in our Power to improve our Fields and Gardens.

Mr. Fairchild of *Hoxton*, who has been very diligent and curious in these Enquiries, gave me lately two or three excellent Observations of his own, concerning the Sap of Plants: He tells me, that having grafted the ever-green Oak, or *Ilex* of *Virginia* upon the common Oak, the Leaves of the
common

‘ common Oak, which was the Stock, decay’d, and fell off at the usual Season of the Year ; but the ever-green Oak, which was the Cion grafted upon it, preserv’d its Leaves, and continu’d shooting in the Winter ; so that when Trees drop their Leaves, the Sap remains yet in Motion, and is not gone into the Root, as some People think.

‘ A Case of the like Nature I had once of the Common Laurel, or *Lauro Cerasus*, which I inoculated upon the wild, black Cherry ; the Leaves of the black Cherry dropt about *September*, but the Buds of the Laurel shot or sprouted some Time after, and remain’d green all the Winter.

‘ To this we may add what we observe of the Mistleto, or *Viseum*, which is not only an Ever-green, but even grows and ripens its Fruit a long Time after the Tree it grows upon sheds its Leaves. Mr. *Fairchild’s* Experiment indeed of the *Ilex* is sufficient to shew that Sap has a Mode of Circulation ; and my own Remarks serve to confirm it.

‘ But let us proceed to explain this a little further, and from hence answer the Objection which has been generally made against the Circulation of Sap, viz. that at the Fall of the Leaf the Sap always returns to the Root.

‘ Whoever knows any thing of the Circulation of Blood in Animals, cannot be ignorant that there are Arteries and Veins through which it passes ; the first to convey it from its Fountain, the second to return it back ; and that when this circulative Motion is stop’d, Death ensues.

‘ Every

' Every Plant has Vessels analogous to these,
 ' which perform the same Offices : Those
 ' Plants which loose their Leaves, and do not
 ' grow in the Winter, are like those Animals
 ' which sleep the Winter ; but those Plants
 ' which are ever-green and grow in the Win-
 ' ter, are like those Animals which have a
 ' continued Life ; and yet both of these have
 ' a Circulation of Juices perform'd through
 ' Pipes of the same Kinds we have mention'd.

' Among the Animals which sleep in the
 ' Winter Season, we find that the Urchin or
 ' Hedge-hog, the Batt and the rest, are laid
 ' to sleep at the Approach of Cold, which
 ' thickens their Juices ; and if we bring these
 ' Creatures, in their sleeping State, into a
 ' warm Room, or near a Fire, they recover
 ' their Motion, and become brisker by de-
 ' grees ; but those which have continu'd Mo-
 ' tion, or always an Opportunity of it, are
 ' generally more dull and sleepy in the hotter
 ' Seasons : So that this Difference seems to
 ' depend upon the Temper of the Juices.
 ' And there are many Experiments which
 ' prove that the Difference of Juices in all
 ' Bodies, is caused by the different Frame and
 ' Texture of those Vessels or Strainers they
 ' are filter'd through, as I have hinted in my
 ' Observations for *May*.

' The ever-green Oak has all the Characte-
 ' ristics belonging to the Common Oak, but
 ' the dropping the Leaves ; and 'tis only the
 ' different Model of the Vessels in one and
 ' the other that cause the Variety of Ever-
 ' green, and the contrary ; the Vessels in the
 ' Ever-green dispose the Juices to act with a

' less Degree of Heat, as those in the com-
 ' mon Oak dispose the Juices to require a
 ' greater share of Warmth for their Growth.
 ' The shooting of the ever-green Oak, the
 ' Laurel, and the Mistleto in the Winter,
 ' when the Perdisols are vacant of Leaves,
 ' shew us they have Vessels which frame dif-
 ' ferent sorts of Juices, and the Difference of
 ' those Vessels may be easily discern'd with a
 ' good Microscope.

' The next Observation of Mr. *Fairchild*
 ' is, that to cut a Shoot of a Fig Tree or a
 ' Mulberry Tree, not only in the Summer
 ' but in the Winter, the Sap runs out always
 ' at both Ends ; which shews that there are
 ' as well proper Vessels for the Return of the
 ' Sap, as for it to rise through from the
 ' Root; one End of the before-mention'd
 ' Branches exhibiting the returning Sap, the
 ' other flowing with that which proceeds
 ' immediately from the Fountain through
 ' the Wood Vessels. This Experiment he
 ' shew'd to the *Royal Society* in the Winter,
 ' and helps further to confirm the Circulation
 ' of the Sap : But any thing so new as this
 ' Doctrine, which I first ventured to explain
 ' six Years ago, cannot be too well supported
 ' by Observations and Experiments. I there-
 ' fore shall add an Instance or two more, be-
 ' fore I begin to set forth the Effects of Ino-
 ' culation.

' That the Sap even of those Trees which
 ' loose their Leaves, does not return to the
 ' Root to lodge there in Winter, is evident in
 ' the Trunks of Elms, and other Trees which
 ' are cut from the Roots in Winter, and e-

' ven

' ven after they are bored for Water-Pipes;
 ' many Months after their Fall, we find that
 ' they make Shoots, and spring from every
 ' Joint, as if they had a Communication
 ' with the Root, which they could not do if
 ' the Sap had gone down to the Root at the
 ' Fall of the Leaf. In this case one may ob-
 ' serve that the Pith is not of very great Use
 ' for preserving the Life or Vegetation of a
 ' Tree; I rather think it is the Part wherein
 ' the Flowers, Fruits, and their Parts are
 ' form'd, for we never find it in its Purity
 ' but in the younger Shoots, of a Year old,
 ' or two at most, from whence it is convey'd
 ' to those Sprouts of the Tree which shoot
 ' from them: We find likewise that in some
 ' Plants there is scarce any Pith discernable,
 ' as in the Jessamin, the Honey-suckle, and
 ' the Vine, and also in the Gramineous or
 ' Grassy Tribes; but it may be that Defect is
 ' made good by Nature in the Knots of those
 ' Plants, which, I believe, have a certain
 ' Number appointed for each Shoot; I know
 ' that Wheat and Barley have four Knots in
 ' each Stalk, reckoning from the Root to the
 ' Ear.

' Again, the Vines, whose Cuttings the
 ' Gardeners set in the Winter, when they
 ' commonly say the Sap is down, have so
 ' dry a Look at that Time, that one who is
 ' unacquainted with the Laws of Nature,
 ' would imagine them to contain no Moi-
 ' sture; but it is plain they are not without
 ' it, because they strike Root, and the Root
 ' always proceeds from the Natural Moisture
 ' in the Cutting or Layer, and is enliven'd

‘ or set to work by changing its Element ; as
 ‘ if we bring a Branch from the Air into the
 ‘ Earth, or from the Air into the Water, it
 ‘ will alter its first Design, and sling out Roots
 ‘ where otherwise it would have put out
 ‘ Branches.

‘ In the next Place we may observe, that
 ‘ every Stick which we cut from a Tree in
 ‘ Winter, long after its yearly Growth is
 ‘ finish’d, will push out its Sap with a his-
 ‘ sing Noise at both Ends, if we lay it upon
 ‘ the Fire ; so that it appears the Sap was not
 ‘ gone down to the Root, but was really in
 ‘ the Stick and every other Part of the Tree,
 ‘ only was not fluid enough in the open Cold
 ‘ to push on the Growth of the Tree.

‘ I remember once I saw some large Elm
 ‘ Stakes drove into the Ground to support a
 ‘ Hovel, and one of them which was placed
 ‘ by the Back of a Kitchen Chimney, where
 ‘ a Fire had been constantly kept, had shot
 ‘ out into Leaves about *Christmas*. These
 ‘ Stakes, I was told, had been cut six Weeks
 ‘ before I saw them, from a large Trunk
 ‘ which had been lying in the Farm-Yard a-
 ‘ bove a Year : From this we may be assured
 ‘ that the Sap is always in the Tree as well
 ‘ as the Root, and that when the Tree can
 ‘ have a right share of Heat to keep the Sap
 ‘ in a certain Degree of Fluidity, it will grow ;
 ‘ and we find the same in those Trees which
 ‘ are encourag’d to grow and blossom in the
 ‘ Winter by artificial Heats.

‘ The Experiments of the variegated com-
 ‘ mon Jessamin, whose Leaves are edg’d with
 ‘ white, further declare the Circulation of
 ‘ Sap.

‘ Sap. We find by inarching or inoculating
 ‘ that striped sort into either the plain common
 ‘ sort, or the *Spanish* Jessamin, or the *Indian*
 ‘ or *Brazil* Kinds, that the Malignity, which
 ‘ causes the Whiteness in the Leaves of the
 ‘ first, mixes it self in such a manner with the
 ‘ Juices of the Plants ’tis ingrafted with, that
 ‘ their Leaves become infected and tinged in
 ‘ some Places with the white Colour, which
 ‘ in my Opinion is a plain Demonstration of
 ‘ the Sap’s Circulation, as I have mention’d
 ‘ in my former Works: Nay, if we put only
 ‘ a Bud of the variegated sort into a plain
 ‘ Jessamin, ten or twelve Foot above Ground,
 ‘ the Poison will reach the Branches next the
 ‘ Root as well as those which are at as great
 ‘ a Distance above it, and has also the same
 ‘ Effect upon the ever-green sorts.

‘ The curious Mr. *Greening*, Nursery-man
 ‘ at *Brentford*, told me he had seen some Ash
 ‘ Trees that had been budded or inoculated
 ‘ with some Buds of a striped Ash, which (tho’
 ‘ the Buds had not sprouted) yet the Shoots
 ‘ of the budded Trees, which were below the
 ‘ Inoculations, became variegated or striped:
 ‘ But it is necessary to remark, that there are
 ‘ three sorts of Variegations or Stripes in
 ‘ Plants; that which seems to have the least
 ‘ share of Distemper in it, shews it self in
 ‘ yellow Spots here and there in the Leaves
 ‘ of Plants; but White is a sure Sign of
 ‘ Weakness and Distemper; so that two
 ‘ Leaves are never exactly mark’d in the
 ‘ same Manner. This the Gardeners call the
 ‘ yellow Bloach or Blotch.

‘ The

' The Second is the white Bloach, which
 ' commonly marks the Leaves of Plants with
 ' a great Number of Spots or Stripes; those
 ' which lie next the Surface of the Leaf, are
 ' the whitest; and are, for the most Part, ac-
 ' companied with other Marks of a greenish
 ' white, which lie deeper in the Body of the
 ' Leaf, even in the Ramifications of the Sap-
 ' Vessels; but in neither of these Cases is the
 ' woody Part of the Plant variegated. Mr.
 ' *Fairchild* observes, that where the Leaves of
 ' a Plant are strip'd in this Manner, shewing
 ' three or four Degrees of Colour, there is
 ' hopes of its becoming what the Gardeners
 ' call an Edge; that is, to have its Leaves
 ' edg'd with white, which in Gardening is
 ' thought to be the most beautiful Degree of
 ' striping, and has this certain in it, that it
 ' will not by any Means whatever be again
 ' brought to produce plain green Leaves; the
 ' Wood, the Bark, and the Fruit, is in this
 ' Case always variegated, as well as the
 ' Leaves; so powerfully has the Distemper
 ' establish'd it self in the Tree, when its Leaves
 ' are once edg'd with white, that its most
 ' noble Parts are all ting'd with the Morbid
 ' Matter, and there is no possibility of remo-
 ' ving it; even the very Fruit, its generative
 ' Parts are infected, and its Seed produces
 ' Plants more or less, partaking of the Distem-
 ' per of the Mother-Tree.

' Where Trees are bloach'd or spotted on-
 ' ly with yellow or white, there is a Possibili-
 ' ty of recovering the Plants to their genuine
 ' Verdure, by inarching into 'em an healthful
 ' Stock of the same Species, and letting those
 ' Stocks

' Stocks remain a Year or two, joyn'd with
 ' them ; the Juices of the strong Stocks will
 ' overpower the Distemper, and fling out the
 ' vitiated Juices through the Pores of the
 ' Leaves, which is a kind of Transpiration ;
 ' the strong Stocks, however, may perhaps
 ' shew some Marks of the Distemper, by par-
 ' taking of the uncorrected Juices of the va-
 ' riegated Plant ; but this is not constant ; the
 ' Natural Vigour of the Stock sometimes is
 ' so powerful, that the Venom it receives from
 ' the Plant join'd with it, is not presently to
 ' be discover'd. I may also observe at this
 ' Time, that I have join'd healthful vigorous
 ' Stocks with the old decaying Trees, and
 ' have brought those old Trees to recover
 ' their first Vigour ; which see in the Remarks
 ' for the Month of *June*.

' If we design to communicate the infected
 ' Juices in great Abundance, to any Plant
 ' which we have a Mind should become
 ' striped, the Method now in Practice is, to
 ' chuse such Stocks to bud or inarch upon, as
 ' have their Leaves edg'd, which I have said
 ' before are thoroughly distemper'd, and there-
 ' fore are more capable of infecting the fresh
 ' Plants inoculated or inarch'd upon them.
 ' A single *Bud* or *Eye* placed in the Escutche-
 ' on of the distemper'd Tree, where it can
 ' only receive its Nourishment from the viti-
 ' ated Juices, will become variegated in Pro-
 ' portion as it draws of that Nourishment more
 ' or less, and partake of more of the yellow
 ' or white Juice, than if a Branch was to be
 ' inarch'd, because the Bud has nothing to
 ' nourish it but the Juices of the Plant it is in-
 ' oculated

‘ oculated upon ; but by inarching, the Cion
 ‘ is fed both by the striped Plant, and a Plant
 ‘ of Vigour which causes less striping. We
 ‘ have some Instances of this at Mr. *Fairchild*’s
 ‘ at *Hoxton*, and other Places.

‘ The Method of inoculating of Plants is not
 ‘ unlike the Manner of inoculating the Small-Pox
 ‘ in Humane Bodies ; we open the Bark of the
 ‘ Plant we design to inoculate, till we disco-
 ‘ ver the flowing Juices from those Vessels
 ‘ which act as Veins, and then immediately
 ‘ apply the Bud with Part of the Bark which
 ‘ joins it to the Place we have open’d; obser-
 ‘ ving, that the Bark adjoining to the Bud,
 ‘ has those Parts with it, that according to
 ‘ Nature’s Rules should next be placed to
 ‘ what I call the Veins of a Tree ; we then
 ‘ bind it on, and let it remain till it be-
 ‘ gins to grow : And in all the Experiments
 ‘ we make, according to the above Directions,
 ‘ we shall find the Plants or Cions will partake
 ‘ of the strip’d Colour or Variegation, which
 ‘ among the Virtuosi in Gardening is so much
 ‘ admired, that a Plant whose Leaves are
 ‘ well striped with white or yellow, will sell
 ‘ for more than twenty Times the Value of
 ‘ it when its Leaves are plain ; the striped Hol-
 ‘ lies, Oranges, Lemons, Mirtles, with above
 ‘ an hundred more sorts of striped Plants,
 ‘ which Mr. *Fairchild* has collected, are so
 ‘ many Witnesses of it.

‘ From these Observations, I think it is as
 ‘ evident, that the Sap circulates in Plants, as
 ‘ that the Blood circulates in Animals, and
 ‘ that there is the same possibility of ingrafting
 ‘ Distempers, and vitiating the Juices of Ve-
 ‘ getables,

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'veral Experiments which have been made,
 ' of transfusing the Blood of Brutes into the
 ' Vessels of Men ; and has succeeded so far,
 ' as to make the Men partly to partake of
 ' the natural Temper of those Brutes. The
 ' Operation, if I forgot not, was made upon
 ' some Malefactors ; who had first a great
 ' Quantity of Blood taken from them, and
 ' then by a certain Method, the Blood of a
 ' Dog in one, and that of a Sheep in the o-
 ' ther, was made to supply their Loss of
 ' Blood. Several Instances of this kind we
 ' have in the *Philosophical Transactions* ; and
 ' as often we hear of the natural Tempers
 ' of the Creatures, in which the Blood was
 ' transfus'd, being chang'd by such Transfu-
 ' sion. If this is so, and that a Man or
 ' any Animal can live, and the Blood of a
 ' Dog or a Sheep become agreeable to his
 ' or their Blood, so as to circulate together,
 ' I doubt not but if either the Dog or the
 ' Sheep had any poisonous Particles in their
 ' Blood, it would have appear'd upon the
 ' Men, or any other Bodies it was transmit-
 ' ted into ; the *Mange* or the *Murrain* would
 ' have caused some serophulous Distemper.
 ' 'Tis therefore I am inclined to think,
 ' if I find a Plant compleatly variegated (or
 ' edg'd with Stripe) that by transfusing some
 ' of the vitiated Sap into the Vessels of One
 ' of another Tribe, I may cultivate a Varie-
 ' gation in the Leaves of the Plant which I
 ' transfuse the Sap into : For Example ; if I
 ' find a Peach Tree, whose Leaves are well
 ' striped, I would take of the Juice of those
 ' Parts of the Leaves which appear'd white
 ' or

' or yellow, and opening the Bark of a Plum
 ' Tree, or even an Apple Tree, pour in
 ' some of this vitiated Juice, and bind it up ;
 ' or else take off the Parts of Leaves that
 ' were variegated in one, and stripping them
 ' of their Skin, would bind them into the
 ' Incision in the same Manner that we ino-
 ' culate a Bud ; or perhaps to inoculate a
 ' striped Bud of one Tribe into a Tree of
 ' another Tribe, might answer what I pro-
 ' posed. To help this Conjecture, I design
 ' to try whether it is not possible to make a
 ' Dog mangy, by inoculating some of the
 ' Pustules with their purulent Matter, ta-
 ' ken from a Person who has the Itch, or some
 ' other scrophulous Distemper. But I have
 ' exceeded the Bounds of a Letter ; I shall
 ' therefore take another Opportunity of en-
 ' larging upon this Subject.

I am, S I R,

Your most humble Servant,

R. Bradley.

An Account of the ANANAS, or West-Indian Pine Apple, as it now flourishes in Sir Matthew Decker's Gardens at Richmond in Surrey, under the Care and Management of his ingenious Gardener Mr. Henry Telende.

THE Plant I am going to treat of is call'd the *Pine Apple*, from the Resemblance the Shape of its Fruit bears to the Cones or Apples of the *Pine Tree*; but in nothing else but the Shape of the Fruit is the *Pine Tree* and the *Ananas* alike: The Cones or Apples of the *Pine Tree* Race, such as *Firrs*, *Cedars*, and even one may mention among them the *Cypress*, appear knotted or knob'd, like the Fruit of the *Mulberry*, but are much larger, as are the Fruit of the *Ananas*. The Cones I speak of are of a woody Substance, whether on the *Pines*, *Pinasters*, *Firrs*, *Cedars*, or *Cypress*; but the Fruit of the *Ananas* is soft, tender and delicate, and excels all the Fruits in the World in Flavour and Richness of Taste. The Cones of *Pines* and *Firrs*, we must observe, are of different Shapes; some painted at the Top of a Conick Figure, as the Apples or Cones of the *Scots Firr*; others of equal Bigness at Top and Bottom, like the Cones of the *Cedar of Libanon*; and as these Cones vary in their Shape, so do we find the Fruit of the *Ananas* has different Figures.



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gures. I find some of the *Ananas* with Fruit almost pointed on the Top; some broader on the Top; in a Word, the Figures or Forms of the *Ananas* Fruit are as various as the Apples or Cones of the *Firr* or *Pine* Tribes; which I have often observ'd in those Fruit of the *Ananas* which have been brought us as Rarities from the *West-Indies*.

But as the *Pines* and *Firrs* make large Trees, so on the other hand our *Pine Apple* is an Herbaceous Plant, Perennial, and bearing Leaves in the Manner and Form of an *Aloë*; they are indeed less juicy or succulent than those of the *Aloë Succotrina*, but for the most part saw'd on the Edges like it: Some Kinds of our *Pine Apples* have Leaves above two Foot long, which grow more upright, others curl their Leaves backwards; and again, others are short and slender. In the *Amsterdam* Gardens, I have observ'd about twenty sorts which one might well enough distinguish by the Diversity of their Leaves, but the Directors there had not the Art of shewing us their Diversity of Fruit; one Fruit, I confess, I have seen there, but it was not larger than a common *Newington* Peach, and even that was esteem'd a great Rarity.

From the Enquiry I made there, I found that some of the Plants were brought thither from the *Dutch* Factories in the *East-Indies*; but the greatest Number of sorts came from *Surinam* and *Curasau*, belonging to the same Nation in the *West-Indies*; from both which Places their whole Store of *Ananas* amounted five Years ago to about 200 Plants, which by the Skill of the Gardener, were in better
Health

Health than any I had ever seen in *England*, or any other Part of *Europe*; but the Art of bringing them to Fruit was not yet understood.

But Mr. *Le Cour* of *Leyden*, a Gentleman of extraordinary Skill in the Affair of Gardening, was not discouraged by the ill Success which we had all met with in the Education of this Plant; he resolved to spare no Pains or Expence to bring this delicious Fruit to Perfection, if possible, and render it familiar to this Quarter of the Earth; he built Stoves of divers kinds, as I am inform'd, to a great Number, before he met with one that would answer his Design, and at length had the Happiness of producing and ripening several hundred Fruit in a Year, and encreasing the Plants to that degree, that his Gardener told me he often bury'd or flung away some Hundreds of them. By this Gentleman's Curiosity and generous Disposition, the excellent Flavour and rich Qualities of this Fruit became known to most of the great Personages in and about his Nation: For, tho' every Year the Traders to those Countries, where this Fruit is natural, bring home the *Pine Apples* growing, to be ripen'd here, yet that Fruit has not the high Flavour which is found in those which are cut full ripe in the Place of their Education. I have seen some Fruit of Mr. *Le Cour's*, which were about four Inches long, and far exceeded that which I observ'd in the *Amsterdam* Garden for Substance; and we are beholden to this Gentleman for sending Plants to *England*, which now produce much larger Fruit than, as I am told, he has yet had in his own Garden.

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'Tis not long since I was Eye-witness to several fruited *Pine Apples* at Sir *Matthew Decker's*, at *Richmond*, about Forty in Number; some ripening, and others in a promising Condition; the least of which Fruit was above four Inches long, and some were as large as any I have seen brought from the *West-Indies*: I measured one near seven Inches long in pure Fruit, and near thirteen Inches about; it was within two or three Days of being ripe, and was then Yellow on the Outside, not unlike the Colour of Orpement. Among these curious Plants, I observ'd some Fruit which tended to Ripeness, that were more inclining to a purple Colour; and some Plants which were not yet set for Fruit were very remarkable in their Leaves, by being striped with Red; but every sort I found were equally vigorous by the same Way of Management, and in my Opinion would have all been fruitful at one Time, if they had been of the same Age or Growth.

But not to dwell too long upon the History of their coming among us, I proceed to give an Account of the Method now practis'd at Sir *Matthew Decker's* at *Richmond*, for the Production of this excellent Fruit, which Mr. *Henry Telende* his judicious Gardener has render'd so easy and intelligible, that I hope to see the *Ananas* flourish for the future in many of our *English* Gardens, to the Honour of the Artist, and the Satisfaction and Pleasure of those who can afford to eat them.

Mr. *Telende's* Account of the Progress of the Plant from the first slipping or planting the
Crown

Crown of the Fruit to the ripening Fruit, upon those Suckers or Plants, is as follows.

In *July* and *August*, we are to take off the Suckers, or young Shoots which sprout from about the Root of the large Plants, and it is then necessary to prune off the wounded Parts at the Root End of the Suckers till we make them smooth, and can perceive little Spots, which shew us the Rudiments of the Roots. These young Plants so prepared, must be planted singly in such Pots as are commonly used for *Auriculas*, which are about six Inches in Diameter on the Top, and somewhat more than four Inches wide at the Bottom ; in the planting these, as well as the Crowns, we must press the Earth very close and hard about them.

The Earth most proper for them, as I am inform'd, must be very finely sifted, and rather light than stiff, such as a sandy Loam, of a black sort ; but if it is a mixt Soil, it should be three or four Years old to be well incorporated.

This Time of Planting, and the Degree of Heat which Mr. *Telende* gives them, makes them strike Root in a short Time ; and from what I can learn, some of the same Plants will prepare for Fruit the Spring following, especially the Crowns of the Fruit, as in Figure V at A. The Time of their Blossom at *Richmond*, is commonly about *April*, when their Fruit appears about the Bigness of a Tennis Ball ; but this depends upon the Degree of Heat: The Flowers then shew themselves single on each Knot or Knob of the Fruit,

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Fruit, about ten Parts in twelve of an Inch in Length, of a blew Colour ; but it is observable, that those which produce Fruit of the Red kind, bear Flowers of a deeper blew than those of the Yellow sort ; which Kind the Figure represents. Here it is observable, that from the first Appearance of the Fruit among the Leaves, to the Time of its bringing the Flowers, is about three Weeks ; and then the Blossoms begin to open on the lower Ring of Knots or Knobs of the young Fruit, and gradually flower to the Top of it in about eight Days Time ; but this Time of flowering is in proportion to the Bigness of the Fruit. As it is longer or shorter, its Number of Circles or Knots will be more or less ; for as the Fruit is longer, the Circles of Knobs are in greater Number ; and as all Flowers have a certain natural Time of Appearance before they fade, so consequently those Fruit, which have the largest Share of Circles, must hold longer in Blossom than the small ones.

Mr. *Telende* reckons about five Months from the first Appearance of the Fruit to the Time of its full ripening ; and observes, that when it tends to Maturity, it first changes from green to a grey or whitish Colour, and in about nine Days more it is fit to cut, having then gain'd its full Colour and Flavour : But I suppose it will not ripen in Winter so quickly from the Blossom, as it does with him, who has for a Year or two ripen'd them in the hottest Months. He tells me, that to judge rightly of the Ripeness of the Fruit, he first examines whether it is of

the Yellow or the Red sort, and if it is of a full Colour ; also he observes, that when either sort changes towards Brown, it is past its Excellence, or is over ripe ; but if it is in full Perfection, we may press in the Knots or Knobs of the Fruit gently with the Finger and Thumb, and they will return again. The Yellow or Red sort must be bright in Colour to be good.

When the Fruit is ripe, the next Thing to be consider'd is, how to bring it upon the Table, and manage it there ; for this Fruit is of that Nature, that if it is not skilfully prepar'd after it is gather'd, it looses half its Beauties.

It is commonly cut from the Plant with a long Stalk, so that it may be set upright in a Tube of Glass, to crown the Top of a Pyramid of Fruit ; and whosoever once tastes of it, will undoubtedly allow, that it deserves a Place above all other Fruits, as well for its beautiful Appearance, as for its delicious Flavour, which partakes of every Thing that can be found agreeable in all Kinds of Fruit.

To prepare it for Eating, hold the Fruit B in one Hand, while with the other you twist off the Crown of Leaves at the Top ; which should be presently return'd to the Gardener, to be clear'd of the Pulp which adheres to it, and planted for Increase. When the Crown of Leaves is off, begin at the Top to pare off the Rind of the Fruit ; which must be so done, that none of the out-side Husks remain, which would be very troublesome in Eating. When this is done, cut it in Slices, crossways, to be laid singly upon

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a Plate ; for if they are laid upon one another, 'tis hard to separate them, the Fruit being of a gummy Nature, sticking like Honey. Thus is it ready for Eating without any Addition of Sugar, Wine, &c. to help its Flavour.

The next Thing to be mention'd, is Mr. *Telende's* Method of making the Hot-bed of Tanner's Bark, for the Education and Ripening this Fruit in the more gentle Seasons of the Year ; and this I shall set down exactly agreeable to his present Practice, which may serve as the Standard and Pattern to all the rest ; for whatever Invention comes into the World so perfect as this has done, I think should not be vary'd in any Thing, lest we spoil it, as too many have done already, by endeavouring to mend good Things.

First, his *Frame* is made of Whole Deal, closely joyned, after the Manner of an hot-bed Frame, but its Proportion is different.

The Length of this Frame is eleven Foot, divided equally into four Lights or Pannels of clear Glass, in Pains of a moderate Size ; the Wideness of the Frame is seven Foot and half ; the Back is three Foot high, and the Front about ten Inches.

The Place or Pit for the Hot-bed is somewhat more than five Foot deep in the Ground, made proportionable to the Length and Breadth of the Frame ; the Sides of this Pit are lin'd with Brick-Work, and the Bottom cover'd with Pebbles or Rubble Stones. This being prepar'd, he provides, about the Middle of *February*, as much hot Dung or Horse-Litter for the Foundation of this Bed

as will raise it from the Pebbles about a Foot high, and then lays on the Tanners Bark as equally as possible, till the Case of Brick-Work is fill'd, beating down the Tan gently with a Prong, or pressing it down easily with a Board; for if it was to be trod, or beat too hard, the Tan would not heat in three Months. A Bed of this Kind, he tells me, will take up three hundred Bushels of Tan, or Tanners Bark; and if it be well made, will heat in about fifteen Days, provided the Frame and Glasses are set over it; but if it remains uncover'd, it will not come to its Heat in less than six Weeks Time.

When the Bed breaths a right Heat, which we are to judge of by a Thermometer, (as I shall mention by and by) we bring the Plants from the Stove to it, either to have their Pots quite plunged into the Bark or Tan; or if upon opening the Holes for them, we find the Bark too hot, then set them in only half Way, laying a few Pebbles under the Bottom of each Pot, that the Water may pass freely through them. We are also to take Care that we do not remove the Plants from the Stove to the Bed, in Frost or Snow, for fear of injuring them: And we must as carefully examine our Bed from Time to Time, whether the Bark grows mouldy, musty, or dry, which it will often do in the Summer; we must, in such Case, water it to recover its Heat.

The *Ananas* is no great Lover of Water; a very moderate Proportion only must be given at the Time it does not grow or shoot; but frequent and gentle Refreshings are necessary

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cessary when the Plant flourishes, and especially during the Time of the Growth of the Fruit.

A Bed of Tanners Bark, prepar'd and manag'd according to these Directions, will maintain a constant Degree of Heat, sufficient to give these Plants the utmost Vigour they require, from about the End of *February* to the End of *October* following; and then the Plants must be again remov'd into the Stove or Conservatory.

During the Time the Plants are in this Bed, we are constantly to keep them cover'd with the Glasses, unless at Times of Watering, or such necessary Works as are unavoidable. In the excessive Heats, indeed, the Glasses are tilted up at the Back of the Frame; and at such Times when the Evenings are cool, the Bed must be carefully cover'd with substantial Mattresses of Straw. A Bed of this kind sinks about a Foot, from the Time of making it to the End of Summer; which happens to be very convenient in this Affair, or else the Plants would grow too tall for the Frame, before the Time of housing them.

The Water, (Mr. *Telende* observes) which is necessary to refresh or water these Plants, should be kept in a Place where the Heat is equal to that of the hot Bed; or when they are in the Stove, he would have the Water set in the same Place, that they may not feel the least Check by receiving Water, which is colder than the Air they breathe.

Thus we are, by the foregoing Remarks, instructed in the Method of preserving and forwarding the *Pine Apples*, from the Middle
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of *February* to the End of *October* ; and at the same Time we may judge how useful such a Method of Culture would be to all such Plants as are Natives of Climates as hot as *Jamaica*, the *Caribbee Islands*, and two or three Degrees more *South*. The *Guava*, which comes from thence, a Fruit of delicate Flavour, will ripen here as well as the *Pine Apple* ; and there is no doubt, in Reason, but the *Bananas*, *Plantains*, and even the *Mango*, would prosper as well with us, since the ingenious Person who has brought the *Pine Apples* to the same Perfection in *England* that they attain to in their own Country, has pointed to us in a Thermometer, the just Degree of Heat he constantly gave them ; which Heat is then surely agreeable to that of the Country they came from, for otherwise they could not appear under his Care with so good an Aspect as they now do, even as large, as fair, and as well tasted, as those in the *West-Indies*.

The Stove I have mention'd in this Month's Observations, with the Iron Plates over the Flues, is of that sort he uses ; but for the greater Warmth, his is cover'd thick with Thatch on the Roof, and the Glasses well guarded with Shutters ; and that the Fire under it may be constant, he burns only such Turf as is commonly us'd in *Holland*, agreeable to Mr. *Le Cour's* Method, whose great Skill first brought these Plants to be admired in the *European Gardens*.

But as I observ'd before, that the Degree of Heat necessary for this End, was pointed out to us by a Thermometer ; so the same Degree of Heat must be as well observ'd in
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the hot Bed as in the Stove or Conservatory; we find by the Consequence, that it agrees with that of the Country where the *Pine Apples* grow naturally : And by the same *Thermometer* we find, that the Heat of the Stoves and Hot-beds may be raised much higher, even to be equal to the Heat under the Line or Equator ; so that there is not any Plant upon Earth which may not be made to grow in *Britain* by such Helps. The *Spice Trees*, or Plants of the hottest Climes, whether the *Nutmeg Tree*, the *Cinnamon Tree*, the several sorts of *Clove Trees*, the *Pepper* or the *Ginger*, will certainly prosper in such Stoves, if we give them their exact Share of Heat.

The *Thermometer* used by Mr. *Telende*, has a Tube about Twenty four Inches long, and the Diameter of it about one eighth Part of an Inch ; in which he has remark'd, when the Spirit rises to fifteen Inches, the Air is cold for his Plants ; at sixteen Inches and half, *temperate* ; at eighteen Inches, *warm Air*, which is his Standard for *Pine-Apple Heat* ; at twenty Inches, he marks *hot Air* ; and one and twenty Inches and half, *sultry* : But these Degrees are differently mark'd from the same Denominations in our common *English Thermometers* ; his temperate is about our warm Air ; his warm Air, our hot Air ; and our hot Air is about the same with his sultry.

I think there cannot be any Instrument more useful to Gardeners, who have the Management of Stoves or Hot-beds, than *Thermometers*, regulated according to these Observations ; and I have therefore directed some to be made for Hot-beds as well as Stoves, by which

which we may at once be apprised of the Degree of Heat under the Line, and of the several Degrees distinctly mark'd for the Natural Plants of every Climate, from the Line to the 52d Degree of Latitude.

In these *Thermometers* I shall mark the Names likewise of the principal Places, with their Degrees of Latitude, and Summer Heat, whether they lie *North* or *South* of the Line, and also the different Times of Spring in the several Countries I shall mention, that so every Gardener may understand when it is proper to apply his Heat in full Force, and what Degree of Heat he ought to use for the Welfare of any Plant he receives from any Part of the World. These Instruments may be had at Mr. *Thomas Fairchild's* at *Hoxton*.

But because every one of my Readers may not, perhaps, rightly understand the Meaning of *Thermometer* or *Thermoscope*, I shall here explain it : The *Thermometer* is an Instrument commonly made of Glass, fill'd with tinged Spirit of Wine, or some other proper Liquor, design'd to measure the Degree of Heat or Cold of any particular Place, or at the same Place at different Times and Seasons.

At the Bottom of this Instrument is a pretty large Ball of Glass, filled with tinged Liquor ; out of which rises a Stem or Tube about three or four Foot perpendicular : To adjust the Degrees of which, the Ball may be placed in Water which is just beginning to freeze, and then noting the Height of the Spirit in the Stem, make any particular Mark against it, O for Example ; and graduate it afterwards up and down for Heat and Cold.

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This is used with us, and shews the several Degrees of Heat or Cold in our Climate. But besides this Instrument, it is necessary our Husbandmen and Gardeners should be acquainted with some others, which will inform them of the Approach of wet or dry Weather, that their Affairs in the Fields and Gardens may be directed with some Certainty. The first is

The *Barometer* or *Baroscope*, an Instrument for estimating the Minute Variations of the Weight or Pressure of the incumbent Air; it is a long Tube of Glass hermetically sealed at one End, and being filled with Quicksilver, is inverted so as to have the open End of it immersed or dip'd in stagnant Quicksilver, contain'd in a larger Glass under it; which larger Glass is exposed to the Pressure of the outward Air, (after such Immersion) the Quicksilver in the Tube being suffered to run as much as it will into the stagnant Quicksilver, in which that Mouth or open End is immersed, there is wont to remain a Quantity of Quicksilver suspended in the Tube, about Twenty Eight, Twenty Nine, or Thirty Inches high, measuring from the Surface of the stagnant Quicksilver perpendicularly; but more or less within such Limits, according as the Weight or Pressure of the Air incumbent on the external stagnant Quicksilver exposed to it is more or less, leaving the upper Part of the Tube void, or at least empty of common Air.

The next is the *Hygroscope* or *Hygrometer*, an Instrument contrived to shew the Moisture or Dryness of the Air, according as it abounds

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with moist or dry Vapours, and to measure and estimate the Quantity of such Moisture or Dryness. Of this and of the foregoing sort there are many Varieties, which I shall mention and explain more fully in the succeeding Month, for the Advancement of Husbandry and Gardening; but I cannot conclude this Piece without observing, that was the Method of cultivating this Fruit or any others that are famous in the *East* or *West-Indies* rightly understood, we might be supply'd with them in every Month of the Year; the *Guava* has been brought to Ripeness at *Christmas*, by the Directions of the late excellent Dutchess of *Beaufort*.

What remains yet to be explain'd of *Fig. V.* is, that C represents the Blossom of the *Ananas* in its full Proportion upon the Knot which it grows upon, as it appears at the Time of Flowering.

D is one of the Knots of the Fruit in its full Bigness, when the Fruit is ripe and has been well managed.

Let-

Letter to Mr. R. S. of Surrey, concerning planting and raising a Coppice or Close Wilderness with the greatest Expedition, with the Method of Embellishing it with wild Flowers: As also some Hints for rendring it still more rural, by raising of tame Pheasants and Partridges.

S I R,

I Had the Pleasure of your Commands relating to a Coppice or Close Wilderness, dated June 16. I find every one agrees with you, that to find an Invention for making such a Plantation compleatly at once, would save Time, and that it would be, in some sort, adding to the Length of our Days.

I have been diligent to observe the Plantations made in several Nurseries, and have as industriously enquired the Time of planting of every Parcel of Trees growing in them, that I might at least let you know how long you must wait for the Perfection of the Plantation you design.

By the Perfection of such a Plantation, I mean, that it be planted compleatly, and that every Plant be in that vigorous way of Growth, that we may look upon it rather

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as

' as a Natural than an Artificial Work. I
 ' have seen a Plantation of this Nature, which
 ' has been only Four Months planted, that
 ' has grown above Four Foot high ; and the
 ' Second Year, some of the Plants have been
 ' above Eight Foot, which is high enough
 ' to give a pleasing Prospect. This I ob-
 ' serv'd at Mr. Scot's, a very curious Nursery-
 ' Man near *Chelsea* College.

' The Accident which produced the tall
 ' and upright Shooting of these Plants, gives
 ' me Opportunity of prescribing for your De-
 ' sign, the same Method of Planting as was
 ' practis'd at Mr. Scot's : He transplanted a
 ' large Parcel of young Elm Plants out of the
 ' first Bed in *March*, 1720. setting them in
 ' Rows about Six Inches distant from one
 ' another, and the Lines about a Foot apart ;
 ' by which means they were not subject to
 ' make too many collateral Shoots, but were
 ' all enclined to rise and meet the Air above ;
 ' so that these upright Shoots had not only
 ' their own natural Share of Nourishment,
 ' but likewise enjoyed all that should have
 ' gone to the Furniture of the collateral
 ' Branches. In short, this Method of Plant-
 ' ing answer'd the End you seem to desire,
 ' better than any I have seen ; that is, it
 ' grew up in about Eighteen Months Time
 ' to such an Height, and so fully furnish'd,
 ' that a Plantation in the ordinary Way
 ' would not have done in less than Four or
 ' Five Year's Time.

' 'Tis therefore I would advise, that you
 ' make your Wilderness after this manner
 ' with young Plants, which must be cut pret-
 ' ty

ty near the Ground at Planting, and in two Years or less, you may begin to draw out near half the Plants to be placed elsewhere in your Grounds ; this will encourage the Growth of those which are left standing, by giving them convenient Air, and opening the Earth about their Roots.

Nor will the Charge of making this Plantation be more, than if you was to plant large Trees at due Distances ; the small Plants, though they will be perhaps Eight times more numerous, yet their Price will be in Proportion to their Bigness, they will more surely thrive and grow than large Plants, and fill your Coppice much better, and, as I observ'd before, much more quickly than large Plants : Besides, by their being planted so young, they will more easily be naturalized to the Soil, and prosper Three times as well as others that had been many Years growing elsewhere. We find the same in storing of Ponds with Fish, that if we stock a Pond with Spawn of a Year old, the Fish will be larger in five Years than any Fish we were to put in with them of Three Years old ; for the young Spawn are quickly naturalized to the Water, and thrive more in one Year than a Fish of Three Years old will do in Nine Years, if he changes his Water ; 'tis so hard to conquer Custom.

I remember once a Gentleman of my Acquaintance planted a Thicket of young Plants in the manner I recommend, and the same Year planted a Grove of Trees about
Nine

' Nine Years old ; his Thicket in less than Four
 ' Years grew taller, and had much handsomer
 ' Plants in it than any in his Grove, altho'
 ' the oldest of his Thicket Plants were not a-
 ' bove Two Years old when they were set
 ' in his Wilderness. So that Six Year's
 ' Growth in the Way of Planting which I
 ' propose, gives better Plants than Thirteen
 ' Years, where Trees are planted in Groves
 ' the common Way : Which is, in effect, gain-
 ' ing Seven Years Time compleatly, while
 ' we are passing Six Years.

' In such Coppices I think no Plant is more
 ' agreeable than the Filbeard and Spanish
 ' Hazle, which last may be set in Nuts about
 ' *October* ; for I find no Nurseries which are
 ' furnish'd with them, though I have experi-
 ' enc'd that they grow very well.

' Neither is it necessary to plant this Cop-
 ' pice according to any Plan or Figure ; the
 ' Walks may be cut when it is grown up, and
 ' their Edges border'd with Cowslips, Prim-
 ' roses, Violets, and other wild Flowers, to
 ' make it appear more Rural ; and if there
 ' should be enclosed with it Two or Three
 ' Acres of Ground to be sown with Furze
 ' or Broom, for Harbour or Shelter for Phea-
 ' sants and Partridges, it would be yet more
 ' pleasant.

' We have Instances enough of Pheasants,
 ' though they have the Liberty of the Wing,
 ' that are so tame, that they will every Night
 ' return to their own Home ; and as often as
 ' they are call'd by their Keepers, they will
 ' come to them : They will breed without
 ' any Trouble in such a Place as I have men-
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' tion'd, but the young Ones should be caught
 ' at a Month old and fed; they will then
 ' live upon Corn alone, and may be easily
 ' tam'd and disciplin'd: Nor are Partridges
 ' more difficult in their Management; I have
 ' taken them at two Months old, and made
 ' them so tame and familiar, that they have
 ' follow'd me every where, as well about the
 ' House as without Doors, and some of them
 ' frequently fly upon the Table when I have
 ' been at Dinner, regardless of all Fear.
 ' This is what I shall at present communicate
 ' to you, and am, S I R,

Tours, &c.

R. B.

REMARKS *on the Weather and Pro-*
duce of this Month.

THE Weather at the Beginning was un-
 certain, but the Winds for the most part
 blowing from the West and South West, the
 Air was cool and sharp for the Season; which
 brings to my Mind once more, the Observa-
 tion I made in the preceding Month, of the
 Passage of Mountains or rather Islands of
 Ice from the North towards the Line, which
 I suppose had no small Influence over the
 Weather with us. The Tenth, Eleventh and
 Twelfth

Twelfth Days, the Wind was more West than South, the Weather stormy and rainy, with cold Hail, which injured the Fruit and lay'd the Corn, but chiefly damaged the Hops. From the Twelfth to the Twentieth we had cold Winds, which gradually were more South every Day, and declined in Cold to the Twenty Fifth.

About the Twenty Seventh we had warm Weather, which lasted to the End of the Month, a few short Hurricanes now and then from the South West, but ended North East.

The Garden Fruits of the preceding Month continued, and we had Strawberries till the End, which perhaps might proceed from the rainy Season. The Katherine and many other Kinds of Pears came into the Markets about the Beginning, and several sorts of Plums about the Middle; Genniting Apples were brought to Town likewise about that Time, and Codlings were then very large, but not in Plenty. About the Twentieth I observed the first Nutmeg Peaches and *Turkey* Apricots ripe; Kidney Beans were every where at a moderate Price, all sorts of Gooseberries were ripe, and Melons, though the Season had render'd them ill tasted, were numerous enough: Several sorts of Figs were now ripe, and some Grapes at Mr. Fairchild's. The first ripe *Ananas* of this Year were now cut at *Richmond*, notwithstanding the Difficulty of the Season which the Gardener had to engage with: But it is a Maxim, that the greater Difficulties we have to encounter with, the greater Honour we gain by the Victory.

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Victory. Which leads me farther to take Notice of what I have had the Opportunity of observing this Year in the Gardens of Messieurs *Warners* at *Rotherhith*; these Gentlemen, who are Brothers and near Neighbours, have Gardens curiously design'd for the Propagating of Fruit, and are each of them excellently skill'd in the manner of Pruning, and in that Philosophy which is necessary to bring Trees to good Bearing. The Way of their Management, I think, is near the same; and could every one have the Liberty of seeing their Gardens, in my Opinion, they could not have a better Example for the managing of Dwarf Trees of Apples and Pears in *England*. One of these Gentlemen in this bad Year, in one Part of his Garden, not much more than half an Acre, has more Fruit than any Garden, among the Many I have seen, can boast of in three Acres; yet we may at the same time observe a promising Prospect of Blossoms for the Furniture of the next Summer.

At Mr. *John Warner's*, we observe a little Vineyard, which is so model'd, that it serves even as an Ornament to his Parterre; and is an Example of Vines so judiciously order'd, that out of fewer than an Hundred, and some of them not more than the second Year's Growth, was made a Vessel of Wine containing Ninety five Gallons, which is almost a Gallon of Wine from a single Vine of four Foot high; or to reckon where the Grapes grow, the Vines are not above two Foot from the Ground.

This Gentleman did me the Favour to give me a Taste of the Wine made from these Vines ; and I conceive, was it old, or kept to the Length of Time as Old Hock is generally kept, it would be full as smooth and strong ; but as it was, I found that it possessed the *Burgundy* Flavour, which was the sort of Grape it was made of, and was much more superior to those Wines which grow about *Beauvais* and *Clairmont*, or in any Vineyard on this Side *Paris* : And I doubt not but if this Wine-making Business was carried on with a little Art, many Lands, which now lie idle in *Britain*, might render an extraordinary Return to the Owner. There are several Ways of making Wines abroad, which I have collected, on purpose to introduce Vineyards into *England* ; and I am persuaded, that if the same Grapes which made the Wine I tasted had been managed in a certain Manner which I learn'd from a *Spaniard*, and shall relate in another Month, it would have been as strong again as it is ; or else if a Spirit had been drawn from the Grapes, even if they had not ripen'd, it would have been equal to any *French* Brandy. For among the Vineyard-Men in *France*, they hold it as a Rule, that all Vineyards which make small Wine, make the best flavour'd Brandy ; or even if Grapes are not ripe, they still afford an excellent Spirit. But I shall have an Opportunity of saying more on this Head, when I treat of the several Methods of planting and managing Vineyards, which Subject yet I have but slightly touched upon.

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I take this Ocaſion to thank my Correſpondents for the many ingenious Letters they have ſent me ; and hope they will ſtill continue to proſecute thoſe Studies which may prove ſo advantageous to the Publick, as the Improvement of Land will be. The Method I have taken to publiſh their Remarks with my own, may perhaps, in due Time, fix ſo free a Correſpondence among the Curious in the ſeveral Parts of *Britain*, that many uſeful Things may be brought to Light, which otherwiſe would have never been known. I receiv'd Mr. *L. L.*'s Letter, and think his Advice very good, to perſuade my Countrymen not to ſcruple Writing upon Subjects of this Kind, becauſe it is common with them ; for it is very likely, what may be common in one Country, may be unknown to all the reſt ; and perhaps not only every County, but every Pariſh, may have ſomething generally practiſed, which the next Place may be ignorant of. But I fear it is the ſame in this Caſe that it was in an Affair between two Gentlemen of my Acquaintance ; one of them going to the *West-Indies*, promis'd to bring his Friend whatever curious Plants he could pick up, but returned Home without any at all, telling his Friend, he could not find any Plants in the Countries he had been in, but what grew there wild as Weeds, and that were all ſo common there, that he did not think them worth his Friend's Acceptance, who was ſo curious a Man. This Diſappointment, however, only loſt a little Time, for ever ſince the curious Gentleman, who has the Garden in *England*, deſires his traveling

(230)

ing Friends to bring him the Weeds, or most common Plants they can meet with; and thereby his Garden is continually supply'd with Curiosities.

Such Gentlemen as have any Thing to communicate in the Subjects of Husbandry or Gardening, or whatever may be of use to the Publick, are desired to direct them for me at the Publisher's of these Papers.



End of the Month of JULY.



A GENERAL
TREATISE
OF

Husbandry and Gardening,

For the Month of *August.*

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improve-
ment of Land.

WITH

An Account of such extraordinary In-
ventions, and natural Productions, as
may help the Ingenious in their Stu-
dies, and promote universal Learning.

*To be continu'd Monthly, with Variety of
curious CUTTS.*

By R. BRADLEY, *Fellow of the
Royal Society.*

L O N D O N:

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Pater-Noster-Row.

(Price One Shilling.)



To the Reverend
Dr. BENTLEY,
Master of *Trinity* College, *Cambridge*, &c.

THIS
TREATISE
OF

Husbandry and Gardening,

For the Month of *August*,

Is with the greatest Respect,

Most humbly Dedicated

and Presented by

His most Obliged

Humble Servant,

R. Bradley.

To the Reverend
Dr. BENTLEY

Master of Trinity College, Cambridge, &c.

THIS
TREASURY
OF



Husbandry and Gardening

For the Month of August

is with the greatest respect

Most humbly Dedicated

and Presented by

His most Obedient

Humble Servant

R. Bradley



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A GENERAL

TREATISE

OF

Husbandry and Gardening,

For the Month of *August.*

Observations and Experiments relating to Planting of Trees in Clay, Chalk and Gravelly Soils; with several Improvements, for planting of Wall-Trees, by Mr. Thomas Fairchild and Mr. Whitmill, both of Hoxton, and some others.

THERE is nothing which has given a greater Check to the Progress of Gardening, than the unartful Proceedings of unexperienc'd Men, or of those who will not give themselves Time to consider deliberately what they are about; it is not the bare Knowledge that

that a Tree has a Root, and that the Root must be set in the Earth, that give Success to the Planter's Undertakings; he must know how to judge of the Soil and Situation each particular Tree requires, and learn how to assist either of them without extraordinary Expence. When therefore we meet with Artists of this sort, who have Reason for their Guide, we ought to regard them as publick Benefits.

In the disposing of clay Grounds, chalk or gravelly Soils for Gardens, it is not uncommon to see such wrong Steps taken in the ordering the Works upon them, as tend to the Destruction of the greatest Part of the Plants to be set in them, which seems to happen chiefly from the want of due Consideration in either the Undertakers or Planters.

Where the Surface or the upper Soil is not above Three or Four Inches thick, and the next Stratum or Layer of Earth is stiff Clay, it is a Practice too frequent to dig Trenches for the Beds about Fourteen or Eighteen Inches deep, to remove the Clay and Earth dug out of them, and fill them again with fine fresh Earth brought from some other Place. The Arguments which I have heard for this Method are chiefly these; *viz.* that the Surface or first Layer of Earth was not deep enough of it self to nourish the Trees that might be planted in it, and the stiff Clay below it would be very pernicious to Trees of most Kinds that were to strike their Roots into it; and to avoid both these Evils, the Trenches were cut, and fine Mold fill'd into them. The Objection to this Practice is, that when the Wet begins to fall, these Trenches
in

in the Clay receive the Water, and are like so many Basons to hold it, and so renders the fine Earth that was put into the Trenches perfect Mud ; for a Body of Clay or Chalk will not admit Water to pass throw it; and therefore it is almost a Miracle to see any Plants live or thrive in such trench'd Beds or Borders, unless they are such as naturally live and grow in Water or in Boggs. I have observ'd many Thousands of Plants destroy'd by planting them in such Trenches of Clay and Chalk ; altho' there were Drains made from them as artfully as possible, yet the Wet always corrupts and chills the Earth in them.

Mr. *Fairchild* well observes, that where the first Layer of Earth or Soil is so thin as in the Case I mention, and the next Layer or Stratum is either Gravel, Chalk or Clay, we should never dig into these bad Bottoms, but raise our good Earth to a due Thickness upon them where we design to plant our Trees, or else to raise Hills of good Earth to plant them on; for a Tree so planted, will turn its Roots when they come near either the Gravel, Chalk or Clay, and spread them in the Surface, tho' it is not thicker than Two or Three Inches. And it is observable, that when Holes are dug in these stubborn Soils and fill'd with good Earth, yet the Trees planted in such Places, when they spread their Roots to the Borders of such Holes, so as to touch the Gravel, Clay, &c. begin to canker, and presently decay.

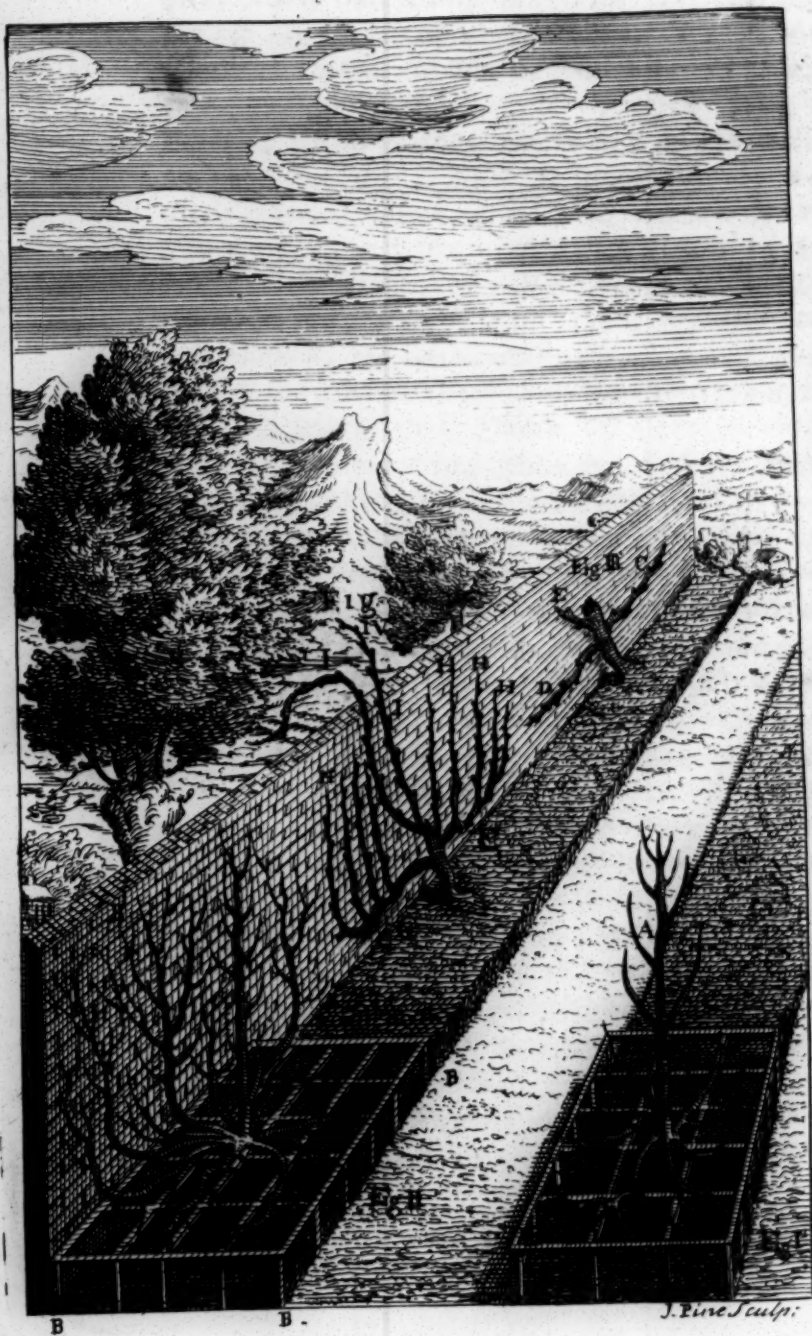
I have also taken Notice, that the surest Way to manage such Grounds as I have been speaking

speaking of, is to pare off all the Surface; and after it has had due Time to mellow, then to lay it in Beds upon the Clay, Gravel, or Chalk, without cutting or trenching so much as an Inch deep into any of them; by which Practice I find Plants thrive and grow well, and are out of Danger of decaying before their natural Time. This is one Way to secure our Trees from harm, by giving them Liberty of seeking and finding out the Nourishment proper for them; but if we encompass their Roots with Earths opposite to their Taste, they starve themselves into Distempers, which occasion their Death.

When we are come thus far, I shall next consider how a Fruit Tree may be planted for a Wall, to receive more Advantages than it will do by the common way of Planting; and for this Thought I am obliged to the curious Mr. *Whitmill*, whom I have mention'd in another Work. He observes very justly, that the common Practice of planting Trees against Walls very often occasions the Trees to decay in few Years, *i. e.* by planting them so near to the Wall that every Part of the Root has not a convenient Space to spread it self, that Part next the Wall must want Nourishment in many Cases; altho' the Vine has an Advantage from the Mortar in the Wall, and the Peach loves to shoot downright in the Earth; but yet, as I have observ'd before from Mr. *Fairchild*, the Root of the Peach will want Moisture in Summer, and can not always find a proper Earth below to nourish it.

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The Method indeed which Mr. *Whitmill* prescribes, is chiefly design'd for such Pears as want the Assistance of a Wall to ripen their Fruit; but it is my Opinion, that every sort of Fruit Tree which is a vigorous Shooter, will agree as well with the Method he directs as the Pear Tree. First of all, he advises to prepare a Bed about four Foot wide, under the Influence of a well exposed Wall, and to plant our Trees about the middle of it, so that the Roots may enjoy the Liberty of two Foot Earth on the Wall Side, before they can reach it; which will give them Strength of Shoot equally in every Part, and preserve them in Health better than the common Way of Planting. But to curb this Luxuriance, and bring the Trees to bearing, the Shoots are to be spread flat or horizontally, so as to make a Covering for the Bed, which perhaps may be near two Foot above the Earth. A few Stakes and common Arbour Poles will direct these Shoots, as we may observe in *Fig. I.* which manner so far as I have yet mention'd, may be seen at Mr. *Greening's*, at *Brentford*, and has a very good Effect.

As the Trees planted and trained in this Way spread themselves, Mr. *Whitmill* would direct all the Shoots which are within reach of the Wall to be nail'd up to it, which will check the Overflux of the Sap, enough to bring the Shoots to a bearing State, if the first spreading of them upon the Poles did not do it. By this Practice a Wall of Eight Foot high will be sufficient for a Tree that would otherwise require one of Twelve or Sixteen Foot,

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and have many other Advantages ; as, first, that the Part of the Tree which spreads over the Bed may be secured from the Frost in the Time of its Blossom, by covering with a Matt, and bring Fruit when the Part nailed to the Wall receives Damage either by Frost or Blight. Secondly, The Reflection of the Wall will contribute to the ripening of the Fruit upon the flat Part of the Tree. Thirdly, That the Fruit will be well nourished, because the Roots have the due Liberty of the Earth, and are not too much exposed to the Sun in hot dry Seasons: And again, no other Thing can grow upon the same Border to rob the Tree of its Nourishment: And there is better Opportunity of letting the over abundant Sap spend it self than can be had in Trees planted against Walls in the common way. The Letter A in the first Figure shews one of the vigorous Shoots, which is left as a waste Pipe, so named and practised by Mefs. *Warners*, who with great Pleasure I had occasion to mention in my Papers for the preceeding Month. This waste Pipe, as I shall call it, serves to rectify the Sap in the other Parts of the Tree, and bring it into a bearing Condition.

Fig. II. at B B, B B, we may observe the Method of training a Fruit Tree against a Wall, according to the Method prescrib'd by Mr. *Whitmill*; and if by this means it is yet too luxuriant, he advises the binding some of the most vigorous Shoots with strong Wire, which he supposes will check the Sap; and in some Cases he even advises the binding close with Wire some of the larger Roots.

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But to curb the Over-growth of Fruit Trees, Mefs. *Warners* cut what they call a wild Worm about the Body of the Trees, or score the Bark quite to the Wood in the manner of a Screw, which must be done with a sharp Knife. Another Practice of these Gentlemen, which is yet more Philosophical, is the grafting here and there some Branches or Cion of good bearing Trees into those which are too wanton in their Growth; which Experiment fully answers the Design, and brings those Trees which are grafted upon to bear well. But I conceive this would yet be more successful, if we were to inoculate or graft the strong Shooters or less bearing sorts of Trees upon the great Bearers; because those Trees which are apt for bearing, will feed the Cions of the vigorous Shooters only with such Sap as is well digested or ripen'd, and will alter their luxuriant Quality at once: whereas the former Method of grafting the good bearing Kinds upon the bad Bearers, requires more Time to render the Tree fruitful; for the luxuriant Quality of a whole Tree working in full Power upon a few Buds or Cions of the good Bearers, they can do little more than resist the fluent Sap for a Season or Two, and must require Time to insinuate their prolifick Virtue into the whole Tree they are grafted into. But this Thought will give me an Opportunity of treating more largely upon the Effect of Grafting in some other Papers. However, since the Subject is now before me, I shall mention an Observation or two which I have made at Mr. *Whitmill's*, that in some degree

may be useful to our present Purpose, and confirm some Experiments of the late excellent Mr. *Evelin*.

Mr. *Evelin* mentions in some of his Works, a Method of grafting Orange Trees; but that Method has had so little Weight with the Gardeners, that I have never seen it practised, till by Accident I found it done at Mr. *Whitmill's* at *Hoxton*, and even then as he told me, it was partly the Effect of Chance which put him upon it; for while his young Orange Stocks were in his Conservatory, the Mice bark'd a Couple of them so near the Root, that there was neither a possibility of inoculating or inarching them, which gave him an Opportunity to try the Experiment of grafting them in two different Ways, the one in the Bark the other in the Cleff; the Success was, that both the Grafts took, and it was observable, that the Orange Tree grafted in the Bark, shot very vigorously the same Summer; while the other, which was grafted in this Cleff, shot with more Moderation, and put out several Blossoms a few Months after grafting; which I suppose might happen from the Pinching of the Cleff, and thereby checking the too vigorous Progress of the Sap of the Stock; both these, however, made very handsome Plants in three or four Months after Grafting.

At the same time, as a matter of great Curiosity, he shew'd me some Myrtles which were inarch'd one upon another, and had taken very well; among these we found the large leav'd Kinds upon the small leav'd Kinds, the Nutmeg Myrtle upon the Upright

right Myrtle, the strip'd upon the plain, and the double Blossom upon several sorts; which brought to my mind some Thoughts I once had, of making a Pyramid of Myrtle, whose Base should be garnish'd with the *Spanish* broad-leav'd Myrtle, to be follow'd with the Nutmeg, and next to that the silver-edged Myrtle, and upon that the Upright sort, to be succeeded by the Rosemary and Thyme-leav'd Kinds to the Point, upon which we might have a Ball of the double-blossom'd Myrtle, which would make a fine Appearance.

While I have an Opportunity of the Copper Plate design'd to explain Mr. *Whitmill's* Method of managing some kinds of Fruit Trees against Walls, I shall take occasion to mention the *French* Method of treating Wall Vines, which has little Trouble in it, and will give us extraordinary Fruit.

In order to which we must first bring our Vines to shoot with Vigour, that we may have two or three Shoots of Strength to lay to the Wall for Service; and this depends upon the Pruning of the small Shoots: For Example, we will suppose we have a young Vine planted in the Spring, 1720, which at *Michaelmas* the same Year, has shot two or three small Twigs about the Thickness of Wheat Straws; when these Twigs have done their Growth, we must cut them down, so as to leave only one Bud upon each Shoot; so that the Spring following, *Anno* 1721, the Sap, which by Nature was design'd to furnish all the Buds in the Twigs we cut off, will be employ'd only to nourish the few
single

single Buds which we left in pruning, and will fling those remaining Buds into vigorous Shoots; which, in the Vine, are those that bring bearing Branches. These Shoots proceeding from the Buds in the Spring 1721, will, at *Michaelmas* the same Year, be at their full Growth; and should not be broken or touch'd with a Knife while they are in Growth, for that will set them to branch, which should be avoided.

When we are come so far as *Michaelmas* 1721, we are next to enquire what Length we may prune the Shoots of that Year too, when we lay them down to the Wall; and that pruning we must order according to the Strength of the Shoots: If they are about nine Parts in Twelve of an Inch Diameter, they may be left about a Yard and Half long; or if about half an Inch Diameter, leave them a Yard; or as they are less, must be shorten'd in proportion; but any of these must be left shorter if their Buds or Joints are close, than if their Joints are wide asunder.

The III^d Figure shews us a Vine pruned at *Michaelmas* 1721, which had Three vigorous Shoots. C is one of them lay'd down horizontally to run parallel with the Border. D is the second Shoot above it, prun'd and lay'd to the Wall in the same manner. And we are to observe the Shoots C and D are to produce bearing Branches, *Anno* 1722. E is the third Shoot prun'd to two or three Buds, which are left to furnish Shoots for laying to the Wall at *Michaelmas* 1722. When the Shoots C, D, are to be quite taken from

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from the Vine, unless a Bud or two, to supply the following Year some Shoots for laying down.

Fig. IV. gives us the Appearance of the same Plant at Fig. III. in its full Growth, and the Manner in which the Shoots or bearing Branches proceeding from those lay'd down *Anno* 1721, ought to be nail'd to the Wall 1722.

F in Fig. IV. is the same Shoot as C in Fig. III. and G Fig. IV. is the same as D in Fig. III. The Letters H H H H, shew the Shoots proceeding from them in 1722 ; and those Shoots mark'd I I, point those strong Shoots, which should be preserv'd to succeed the Shoots F G, when the Grapes are ripe ; for then, as I have observ'd before, F G must be taken away.



A Letter to Mr. Waller concerning the Use of some Earth, and of Quick-silver found in England; with an Account of some Barometers and Thermometers, invented by Mr. John Patrick, in Ship-Court in the Old Baily, London, with their Use in Husbandry and Gardening.

S I R,

‘ I Had the Favour of your Letter concern-
 ‘ ing Minerals and subterraneous Riches,
 ‘ which I am very sensible abound in our
 ‘ *British* Soil, and such as are already dis-
 ‘ cover’d and understood, bring great Pro-
 ‘ fit to the Nation; but I am assured, there
 ‘ are many others that are daily before
 ‘ us, which are at present useless for Want of
 ‘ the right Knowledge of their Virtues. You
 ‘ are certainly very just in your Observation,
 ‘ that we ought not to neglect the Study of
 ‘ these Things; for every Discovery in this
 ‘ Way is a publick Benefit, and gains Riches
 ‘ to a Nation, not only from its intrinsic
 ‘ Value, but by employing many Hands to
 ‘ work it.

‘ The clay Grounds which abound in *Mid-*
 ‘ *dlesex*, especially near *London*, is an Instance,
 ‘ that

that Things of the most trifling Appearance may be render'd vastly profitable to the Owner, the Undertaker, and the Publick, in the making of Bricks with this sort of Earth ; and the Landlords receive large Premiums for the Earth upon every Acre, some five, some six, or some ten Pounds for every Acre, besides as much Rent yearly as they might let their Land for, if it was fit for Garden Ground.

The Undertaker of a Brick-kiln, besides the Charge of the Premium, Rent, and keeping Teams of Horses, may perhaps be at the Expence of about five or six Shillings *per* Thousand for making and burning ; and these Bricks, if they are only Place Bricks, may be sold at *London* for about fourteen, fifteen or sixteen Shillings a Thousand ; or if they are good Stock Bricks, I suppose he may sell them for about twenty Shillings *per* Thousand, in Proportion to his Expence in making and burning them.

The Advantage to the Publick is from the Number of People employ'd in digging and preparing the Earth, in making and modelling the Bricks, in employing Coal to burn them, in loading and unloading them, and carrying them from Place to Place ; in employing those who burn and prepare the Lime, and bring the Sand for Mortar, those who make the Mortar, and those who lay the Bricks for building : so that perhaps one Thousand of Bricks from the making to the laying, may employ twelve or fourteen Hands. But in several Countries, several sorts of Earth are used

' for this Purpose : Some People are lucky e-
 ' nough to find a Vein of Earth, which will
 ' do for this Use simply, or without Mixture ;
 ' others are obliged to mix two or three
 ' Sorts together, to make a Body fit for Brick
 ' Earth, and some near the Sea use Sea-
 ' Ouze to make such as are called Flanders
 ' Bricks.

' In *Devonshire*, and some other Countries
 ' in *England*, there is a sort of red Earth
 ' which the People use for building Walls,
 ' which they call Cobb, their Garden Walls
 ' and Fences about their Houses are general-
 ' ly made with it ; they prepare it first
 ' like a thick Mud, mixing chop'd Straw
 ' with it, and raise their Walls by laying
 ' one Shovel full upon another, and smooth-
 ' ing over the Outside ; this Mixture will
 ' harden in a few Days, and the Walls built
 ' with it will out-last some sort of Stone, as
 ' I have observed in Buildings of both Sorts,
 ' which were erected at the same time.

' When I was last at *Exeter*, a curious
 ' Clergyman told me of an Observation of
 ' his some Years since, in and about that City,
 ' which I think may prove of great Advan-
 ' tage to the Publick, if it was judiciously
 ' sought into.

' This Gentleman tells me, that towards
 ' the East End of the City, when the People
 ' dig deep enough for the Foundation of an
 ' House, it is common to find Quicksilver
 ' dispersed amongst the Earth ; insomuch that
 ' in about an Hour or two, he has gather'd
 ' as much as fill'd a Thumb Bottle, as he call'd
 ' it, or more than the Quantity of two
 ' Ounces ;

‘ Ounces; and at the same time mention’d
 ‘ some Persons now living, who had done
 ‘ the same about the same Place; so that I
 ‘ wonder it has not been more generally
 ‘ taken Notice of.

‘ When I consider the Subtilty of this Mi-
 ‘ neral, how finely its Parts are capable of
 ‘ being divided and separated by the most
 ‘ gentle Warmth, even so as from less than
 ‘ a single Grain evaporated by Fire, to suf-
 ‘ focate four Persons in a large Room; and
 ‘ that, if we put an Ounce or two of it
 ‘ into an hundred Bottles of Water one af-
 ‘ ter the other, and give the Water and Quick-
 ‘ silver together a gentle Heat, every Bottle
 ‘ of Water by this means will gain that use-
 ‘ ful Quality from the Quicksilver, which
 ‘ makes it Sovereign in scrophulous Distem-
 ‘ pers: I say, this declares sufficiently the
 ‘ Subtilty of its Parts; for in these many
 ‘ Times of infusing the same Ounce of Quick-
 ‘ silver, we do not find at the last it has lost
 ‘ of its Weight, altho’ it is plain it has al-
 ‘ ter’d the Quality of the several Waters it
 ‘ has been infused in, and therefore must
 ‘ have partaken of its Parts.

‘ Now, from these, and many more Ob-
 ‘ servations of the like Nature, I am at pre-
 ‘ sent of Opinion, that the Quicksilver which
 ‘ is found in *Devonshire* near the Surface, in
 ‘ small Particles or Drops, may proceed from
 ‘ a great Body of it lying deep in the Ground;
 ‘ and that the small Particles discover’d, as I
 ‘ have related, are Assemblages of the subtle
 ‘ Effluvia, which are continually rising from
 ‘ the Body or Fund below; for in Quicksil-

' ver, we find a natural Tendency of each
 ' Part to the other: For Example, if there
 ' were fifty of the least Drops we can ima-
 ' gine to be lay'd separate upon a smooth
 ' level Body of an Inch square, they will in
 ' a little Time unite or run all into one Mass.
 ' It is therefore worth the Enquiry of those
 ' who live about *Exeter*, to examine further
 ' into this Affair: The Clergyman, who has the
 ' Care of the Parish of *Mamhead*, about six
 ' Miles from *Exeter*, can inform them of the
 ' Place where it was usually gather'd. If
 ' there should be a large Fund or Body of
 ' Quicksilver found in this Place, as there is
 ' good Reason to believe, the Use it may be
 ' of to the Nation is too well known to need
 ' any Explanation, unless in one Particular,
 ' which is so new, that I believe few People
 ' have yet heard of it; which is a Method
 ' for raising Water with Quicksilver, lately
 ' invented by Mr. *Hoskins*, a Gentleman of
 ' great Ingenuity and useful Knowledge, as our
 ' Nation already has experienc'd in several
 ' Instances.

' The Quantity of Quicksilver used for Ba-
 ' rometers at present is but trifling; but should
 ' we once be happy enough to see our Hus-
 ' bandmen and Gardeners come to under-
 ' stand this Instrument rightly, I am persua-
 ' ded few would be without it, and the Ex-
 ' pence of Quicksilver would be greater. It is
 ' my Opinion, such Indexes of Weather may
 ' not only contribute to help us in our Culture of
 ' Plants, but save many a good Crop, which
 ' is often lost for Want of judging rightly of
 ' the Weather.

' The

‘ The Barometers and Thermometers, which
 ‘ I have lately observed at Mr. *Patrick's* in
 ‘ the *Old Baily*, have many Excellencies which
 ‘ are not common in some others I have
 ‘ seen, and therefore I shall send you their
 ‘ Description and Use, in Mr. *Patrick's* own
 ‘ Words.

‘ There is lately invented a curious pen-
 ‘ dent Barometer, wherein the Quicksilver
 ‘ rises and falls perpendicularly, in some
 ‘ twelve, fifteen, twenty, twenty five or thir-
 ‘ ty Inches, instead of three in the common
 ‘ ones.

‘ It discovers the most minute and smallest
 ‘ Alterations in the Air, shewing the Wea-
 ‘ ther much sooner, and more certainly than
 ‘ any common Barometer; and this is an open
 ‘ Tube or Pipe without a Cistern of Quick-
 ‘ silver at the Bottom, wherein the Expan-
 ‘ sion and Contradiction of the Column of
 ‘ Mercury is near three Inches, and this in
 ‘ the most equal Tube yet met with.

‘ By this the Inclination of the Air is to
 ‘ be known at Pleasure; for by moving it a
 ‘ little up and down with the Hand, you
 ‘ shall immediately behold the Quicksilver
 ‘ rise and fall very considerably: Which, if
 ‘ it rise, it will be fair Weather; if it fall,
 ‘ then expect Rain,

‘ Also an excellent diagonal Barometer,
 ‘ wherein the Mercury moves in an oblique
 ‘ Tube, for the Space of thirty Inches instead
 ‘ of three in the common one; and is so
 ‘ nice, as to divide an Inch into an hundred
 ‘ Parts, for the same Purposes as the former.
 ‘ It has a Thermometer on the same Frame,
 ‘ shewing

‘ shewing ninety Degrees of Variation between the greatest Heat and the greatest Cold.

‘ These Barometers will be of particular Use to Farmers, in assisting them in electing Times when to sow and reap: All these are so contrived, that they may be safely sent to any Place compleatly fix’d; and Instructions are given with every Glass, to explain their Uses to the meanest Capacity.

‘ His Rules and Observations for knowing the Weather, by the various rising and falling of the Weather-glass or *Barometer*, are these:

‘ 1. That the least Alterations in the Rise and Fall of the Mercury in the Tube, should be regarded in order for the right finding the Weather by it.

‘ 2. The Rising of the Mercury presages fair Weather, as the Falling indicates the contrary, viz. Rain, Snow, high Winds and Storms.

‘ 3. In Summer, if the Quicksilver be up about fair, and the Weather very hot for four or five Days, then expect black Clouds to rise, and a brisk Gale with Thunder, and a Shower or two, and so go off.

‘ 4. In Winter, the Rising presages Frost; and in frosty Weather, if the Mercury falls three or four Divisions, there will certainly follow a Thaw; but in a continued Frost, if the Mercury rises, it will certainly snow.

‘ 5. When foul Weather happens soon after the falling of the Mercury or Quicksilver, expect but little of it, and judge the same soon
‘ when

‘ when the Weather proves fair, shortly after
 ‘ the Mercury has risen.

6. ‘ In foul Weather when the Mercury rises
 ‘ much, and so continues two or three Days
 ‘ before the foul Weather is over, then expect
 ‘ a Continuance of fair Weather to follow.

7. ‘ In fair Weather when the Mercury
 ‘ falls much, and continues for two or three
 ‘ Days before the Rain comes, then expect
 ‘ a great deal of Wet, and high Winds.

8. ‘ The unsettled Motion of the Mercury,
 ‘ denotes uncertain and changeable Weather,
 ‘ as Sun-shine, some black and white Clouds,
 ‘ with frequent Showers.

9. ‘ If the Mercury be up at Fair and don’t
 ‘ fall, and it happen to rain, then expect
 ‘ but little of it.

10. ‘ If the Mercury be down at Rain and
 ‘ don’t rise, and the Weather proves fair, then
 ‘ expect it not to continue.

11. ‘ We are not strictly to mind the
 ‘ Words that are engraven on the Plates,
 ‘ tho’ for the most part, the Weather will
 ‘ agree with them ; for if the Mercury stood
 ‘ at Much-Rain, and do rise up to Change-
 ‘ able, it presages fair Weather, altho’ not to
 ‘ continue so long as it would have done if
 ‘ the Mercury were higher ; and so on the
 ‘ contrary.

‘ These Directions serve for most Weather
 ‘ Glasses or Barometers now in Use, as well
 ‘ for such where the Mercury or Quicksilver
 ‘ does not move more than three Inches, as
 ‘ those where the Motion of the Mercury is
 ‘ thirty Inches. So far the curious Mr. Pa-
 ‘ trick.

‘ But

' But to know how to judge still with
 ' greater Certainty of the Alteration of the
 ' Weather, we may accompany one of the
 ' foregoing Instruments with an Hygrometer,
 ' which will forewarn us of wet and dry
 ' Weather, by pointing to us the Degrees
 ' of Moisture or Driness in the Air, and
 ' how one or the other increaseth. The best
 ' Instrument I know of this Kind is made
 ' of a Cat-gut, about a Yard in Length sus-
 ' pended, having a Plumet or Piece of Lead
 ' with an Index or Pointer hanging at the
 ' lower End, by which means the Cat-gut
 ' will twist or untwist as the Air dries or
 ' moistens, and shorten or lengthen so as to
 ' raise and sink the Plumet with its Index,
 ' which will mark the Degrees we seek after.
 ' The Weight of my Lead is about two Ounces;
 ' but some who use fine Whipcord instead of
 ' Cat-gut, put a greater Weight of Lead.

' The Twisting or Untwisting of either
 ' the Cat-gut or Cord, occasions the Lead
 ' with the Index to turn round, as well as rise
 ' and fall; so that I chuse to mark my De-
 ' grees upon an open Skrew of Brass, with-
 ' in which the Plumet and Index has its Mo-
 ' tion. There may be many Devices for the
 ' Figure of the Weight or Plumet, as a *Cupid*
 ' with an Arrow in his Hand to point at the
 ' Degrees; or a Bird with Wings extended
 ' for Flight, with some Bough or Branch in
 ' his Mouth to serve for an Index. These
 ' Figures may be gilded for Ornament sake;
 ' others may be contriv'd as Fancy directs.

' When we are provided with these two
 ' Instruments, we should compare the Mo-

' tions

' tions of one with the other, in order to
 ' judge what Proportion the Rise or Fall of
 ' the Quicksilver in the *Barometer*, bears to
 ' the Twisting of the Cord or Cat-gur, whose
 ' Degrees of Motion we may observe by the
 ' Index or Pointer of the *Hygrometer*, and at
 ' the same time compare both these with the
 ' Risings and Fallings of the Spirit in the
 ' *Thermometer*, to know to what Degree
 ' of Heat or Cold attends every different
 ' Change of Weather.

' The *Thermometer*, says Mr. *Patrick*, shews,
 ' by Inspection, the present Condition of
 ' the Air, whether it be hot or cold; which
 ' Day in Summer is hottest, and in Winter
 ' coldest, or any Part of the Day; and from
 ' thence many useful Experiments have and
 ' may be made, *viz* discovering the hottest
 ' or coldest Bath, or the Degrees thereof.
 ' So likewise of any Spring, how much one
 ' exceeds the other in Coldness; and in the
 ' Case of Fevers, being held in the Hand of
 ' the Sick, or otherwise apply'd, as may be
 ' thought proper, it nicely discovers the In-
 ' crease or Abatement of a Fever.

' To the *Thermometer* Mr. *Patrick* speaks
 ' of, is fix'd a Scale of Ninety Degrees num-
 ' ber'd from the Top downwards, with a
 ' moveable Index joining to it, which is
 ' design'd to inform the curious Observer
 ' how the Heat and Cold changes from the
 ' Time he last beheld it, according to the va-
 ' rious Degrees of Heat and Cold in all Lati-
 ' tudes of the World, as by the Tryal of two
 ' *Thermometers* which have been regulated a-
 ' broad; one by the great Dr. *Halley*, Secre-

‘ tary to the Royal Society, in his late
 ‘ *Southern Voyage*, and the other by Capt.
 ‘ *William Johnson*, in his *Whale-fishing Voy-*
 ‘ *age to Greenland*; the first has a Degree of
 ‘ Heat under the Line, and the Degree of
 ‘ Cold in 88 Degrees North Latitude, as
 ‘ Mr. *Patrick* informs me.

‘ When I can persuade my Brother Plan-
 ‘ ters to use these useful Instruments, I hope
 ‘ they will, in their several Stations in and
 ‘ about *Britain*, make their Remarks upon
 ‘ their several Motions, and fixing *London* as
 ‘ the Standard, communicate what Remarks
 ‘ they make in the several Countries they
 ‘ reside in; for by comparing one with ano-
 ‘ ther, we come near a Certainty what Plants
 ‘ will grow and prosper in every Part of the
 ‘ Kingdom, and from many Observations of
 ‘ that Nature, draw such Conclusions as
 ‘ may be of universal Benefit.

I am, S I R,

Yours, &c.

R. BRADLEY.

P. S. I have at length persuaded Mr. *Fair-*
child to publish his Remarks on the *London*
Gardens, which I am sure will suit your
Genius.

As

As I have taken Occasion to publish this Letter in these monthly Papers, I think it not amiss to prescribe a Method for some of my Readers to follow, in the Accounts or Observations they make on the Alterations of the Instruments named in it, *viz.* the *Barometer*, *Hygrometer* and *Thermometer*, the meaning of which Terms I have explain'd in my Papers for *July*.

The Method I shall propose, is that which is now practis'd by the Order and Direction of the Honourable *Samuel Molyneux*, Esq; to whom the learned Part of the World is oblig'd for many grand Discoveries.

To give an Example of this Method according to the Directions prescrib'd by the aforesaid curious Gentleman, we are to provide a Book for Twelve Months Remarks, which are made six times every Day. At which times is observ'd,

1st, The rising or falling of the Quick-silver in the *Barometer*.

2^{dly}, The Alteration of the *Hygrometer*.

3^{dly}, The Rise or Fall of the Spirits in the *Thermometer*.

4^{thly}, The Point of the Compass from whence the Wind blows, and as near as can be guess'd with what Strength. And

5^{thly}, Whether Rain, Snow, Hail, &c. and what Quantity fall'n.

Each Leaf of the Book design'd for this Use must be divided into several Columns; the first for the Day of the Month and of the Week. The Second for the Number of Inches and Parts of an Inch in the Tube of the *Barometer*, where the Quicksilver stands at

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the

the time of Observation. The third, to mark the Degrees pointed at by the Index of the *Hygrometer* at the same Time. The Fourth, to shew the Number of Inches and its Parts in the *Thermometer*, where the Spirit stands at the Time of observing. The Fifth, to mark the Winds, and their strength. And the Sixth, for the Quantity of Rain falling, and Disposition of the Clouds and Air. But I shall give an Example of Five or Six Days in the Month of *June 1721*, taken from the Book I mention, that if whoever has been curious, or will be curious in this way, all Books of this kind may be kept in the same way, and may be more easily compared, and the Difference of Weather or strength of Heat and Cold in several Parts of *Britain* may be known.

Friday,

Friday

JUNE

1721.

9 Morning,

Noon,

3 Afternoon,

6 Afternoon,

9 Afternoon,

Midnight.

<i>Friday, JUNE 2. 1721.</i>	<i>Barometer.</i>		<i>Thermometer.</i>		<i>Wind.</i>	<i>Weather.</i>
	<i>I.</i>	<i>P.</i>	<i>Hygrometer, with its Division and Parts.</i>			
<i>9 Morn- ing,</i>	29	98	240 15	30	East, brisk Gale.	Cloudy.
<i>Noon,</i>	29	98	260 20	28	East, Dit- to.	Ditto.
<i>3 After- noon,</i>	29	98	280 20	28	Ditto.	Ditto.
<i>6 After- noon,</i>	29	98	300 20	27	Ditto.	Ditto.
<i>9 After- noon,</i>	29	98	315 15	28	Ditto.	Ditto.
<i>Mid- night.</i>	29	98	320 5	28	Ditto.	Ditto.

Saturday,

<i>Saturday</i> JUNE 3.	<i>Barometer.</i>		<i>Thermometer.</i>		<i>Wind.</i>	<i>Weather.</i>
	<i>I.</i>	<i>P.</i>	<i>Hygrometer, with its Division and Parts.</i>			
<i>9 Morn- ing.</i>	29	83	360 10	27	East about Calm.	Cloudy.
<i>Noon,</i>	29	80	80 40	26	South, Calm	Rainy.
<i>3 After- noon.</i>	29	78	170 20	26	South, Calm.	Rainy.
<i>6 After- noon.</i>	29	74	80 90	27	East Calm,	Rainy.
<i>9 After- noon.</i>	29	73	130 50	27	East Calm.	Cloudy,
<i>Mid- night.</i>	29	71	100 30	27	East Calm	Cloudy.

Sunday,

<i>Sunday, JUNE 4. 1721.</i>	<i>Barometer.</i>		<i>Thermometer. Hygrometer, with its Divisions and Parts.</i>		<i>Wind</i>	<i>Weather.</i>
	<i>I.</i>	<i>P.</i>				
<i>9 Morn- ing,</i>	29	75	40 60	27	West Calm.	<i>Cloudy.</i>
<i>Noon,</i>	29	73	33 70	26	<i>Ditto.</i>	<i>Ditto.</i>
<i>3 After- noon,</i>	29	71	28 50	26	<i>Ditto.</i>	<i>Rainy.</i>
<i>6 After- noon,</i>	29	69	29 10	26	<i>Ditto</i>	<i>Ditto.</i>
<i>9 After- noon,</i>	29	68	31 20	26	<i>Ditto.</i>	<i>Ditto.</i>
<i>Mid- night.</i>	29	68	31 27	27	<i>Ditto.</i>	<i>Cloudy.</i>

Monday

<i>Monday,</i> JUNE 5. 1721.	<i>Barometer.</i>		<i>Thermometer.</i>		<i>Wind.</i>	<i>Weather,</i>
	<i>I.</i>	<i>P.</i>	<i>Hygrometer, with its Divisions and Parts.</i>			
9 <i>Morn-</i> <i>ing,</i>	29	65	270 40	28	West Calm.	Hazy.
Noon,	29	93	180 90	29	West brisk Gale.	ClearSky.
3 <i>After-</i> <i>noon,</i>	29	62	110 70	29	Ditto.	Hazy.
6 <i>After-</i> <i>noon,</i>	29	55	310 100	28	Ditto.	Cloudy.
9 <i>After-</i> <i>noon,</i>	29	51	350 50	29	West Calm.	Rainy.
<i>Mid-</i> <i>night.</i>	29	47	30 40	31	Ditto.	Ditto.

Tuesday,

Tuesda
JUNE
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9 *Mo*
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Noon

3 *Aft*
noon

6 *Aft*
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9 *Aft*
noon

Mid-
night.

<i>Tuesday,</i> <i>JUNE 6.</i> <i>1721.</i>	<i>Barometer.</i>		<i>Hygrometer, with its</i> <i>Divisions and Paris.</i>		<i>Thermometer.</i>	<i>Wind</i>	<i>Weather.</i>
	<i>I.</i>	<i>P.</i>					
<i>9 Morn-</i> <i>ing,</i>	29	26	80	30		West about Calm.	Clear Sky.
<i>Noon,</i>	29	24	60	31		West brisk Gale.	Rainy.
<i>3 After-</i> <i>noon,</i>	29	14	60	32		<i>Ditto.</i>	<i>Ditto.</i>
<i>6 After-</i> <i>noon,</i>	29	17	70	32		West about Calm.	<i>Ditto.</i>
<i>9 After-</i> <i>noon,</i>	29	23	70	32		West brisk Gale.	Cloudy.
<i>Mid-</i> <i>night.</i>	29	31	70	33		West about Calm.	<i>Ditto.</i>

O o

Wednesday

<i>Wednes- day, JUNE 7. 1721.</i>	<i>Barometer.</i>		<i>Thermometer. Hygrometer, with its Divisions and Parts.</i>		<i>Wind.</i>	<i>Weather.</i>
	<i>I.</i>	<i>P.</i>				
<i>9 Morn- ing,</i>	29	43	70	34	West moderate Gale.	ClearSky.
<i>Noon,</i>	29	46	40 30	33	<i>Ditto.</i>	Rainy.
<i>3 After- noon,</i>	29	49	60 20	33	West about Calm.	Cloudy.
<i>6 After- noon,</i>	29	51	60	32	<i>Ditto.</i>	Rainy.
<i>9 After- noon,</i>	29	56	75 15	33	West moderate Gale.	<i>Ditto.</i>
<i>Mid- night.</i>	29	62	90 15	34	<i>Ditto.</i>	Cloudy.

N. B. In the Column of the *Barometer*,
I. stands for Inches, and P. for the Number
of Parts of an Inch.

From

From an Example of this Nature, any one may easily dispose himself to keep a Weather-Book of the Country he resides in; and by comparing the Motions of the Quicksilver and Spirit with the Weather at the Times of Observation, may, with a little Practice, be able to prejudge nearly what Weather will happen. In some other Papers, I shall explain a little more of the Use of these Instruments, having prevail'd upon several curious Personages to keep the same Kind of Register, in divers Parts of the Kingdom, who have promis'd to send me such Observations as they make, in the Course of these Experiments. I think it would add much to their Value, if we could be assured by a constant Remark, that upon every Change of Wind, there is a Breeze, a Gale, or brisker Motion of the Air than was before, and whether the Wind does not always change in, or immediately after a Storm of Thunder; and those who have an Opportunity of making an Observation at Six a-Clock every Morning, would, I think, very much illustrate an Undertaking of this Kind. But I have said enough of these Instruments at this Time, and am necessarily led to another Subject. My Readers are of different Tastes, and therefore I am obliged to give every Set a different Entertainment; and I hope, some of the more Learned will pardon me, if I now and then explain some of the less common Words or Phrases, which perhaps every one has not had the Opportunity of enquiring into. I therefore shall subjoin a small Lesson taken from the great Mr. Ray, and other learned

Botanists; concerning the Characteristick Notes, of the chief Kind of Plants; wherein is explain'd several proper Terms, which ought to be understood by every one who has any Relation to Botanical Learning, which is the Knowledge of Plants, and is truly the Business of the Husbandmen and the Gardener; we shall number them according to their *Genders*.

Gender 1st, The imperfect Plants, which do either totally want both Flower and Seed, or else seem to do so, there having yet no Seed or Flower been discover'd to belong to them; such as Corals, Spunges, *Algæ Confervæ*, Duck-meat, or *Lens palustris*, the Fungi, or Mushrooms, *Tubera Terræ*, or Truffler, the Mosses, and some Liverworts.

2^d, Plants producing either no Flower at all, or one seemingly imperfect, and whose Seed is so small, as not to be discernable by the naked Eye: Some of these bring their Seeds on the back Parts of their Leaves, as the Maiden-hairs, Spleenworts, Polypodium and Ferns; others bear it on the Stalk it self, adhering there by small single Footstalks, as the Lichen *Terrestris*, the *Lycopodium*, or Wolfs-claw, the Golden Maiden-hair, the Moon-wort, Horse-tail, &c.

3^d, Those whose Seeds are not so small as singly to be invisible, but yet have an imperfect or staminous Flower; *i. e.* such an one as is without the Flower Leaves, having only the Stamina, and the Perianthium; as Hops, Hemp, *Mercurialis*, Nettles, Docks, Sorrels, Arselmart, Knot-grass, Pond-weed, Oracle, Blite, Beet, Ladies-mantle, &c.

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4th, Such as have a compound Flower, and emit a Kind of white Juice or Milk, when their Stalks are broken; such as Lettice, Sow-thistle, Hawkweed, Dandelion, Succory, Goats-beard, Nippleworts, &c.

5th, Those which have a compound Flower of a discous Figure, the Seed Pap-pose, or winged with Down, but emit no Milk like the former; as Colts-foot, Flea-bane, Golden-rod, Ragweed, Groundsel, Cudweed, &c.

6th, The capitated Herbs, or such whose Flower is composed of many small long hollow Flowers, gathered together in a round But-ton, Ball, or Head, which is usually cover'd with a Scaly Coat; of which Kind are the Thistle, the greater Burdock, Blue-bottle, Knapweed, Saw-worth, &c.

These have all Down adhering to their Seeds.

7th, The Corymbiferous Plants, which have a compound discous Flower, but their Seeds have no Down adhering to them: The Name is taken from the Manner of bearing its Flower in Clusters, and spreading round in Form of an Umbrella, as Onions, &c. of this Kind is Corn-Marigold, common Ox-Eye, Yarrow, the Daisie, Camomile, Tansie, Mugwort, Scabious, Teasel, Eryngos, &c.

8th, Plants with a perfect Flower, and having only one single Seed belonging to each single Flower; such as Valerian, Corn-Sallet, Agrimony, Burnet, Meadow-Rue, Fumitory, &c.

9th, The Umbelliferous Plants, which have a Peta Flower, (i. e. having just five small Petal

Petalor Flower Leaves) belonging to each single Flower; there are two Seeds lying naked, and joined together. They are call'd *Umbelliferous*, because the Plant, with it's Branches and Flowers, hath an Head like a Lady's Umbrella, which they call Umbella.

This is a very large Genus of Plants, which therefore is subdivided into,

1. Such as have a broad flat Seed, almost of the Figure of a Leaf, or which are encompassed round about with something like Leaves; as Cow-parsnep, Wild and Garden Parsnep, Hogs-Fennel, &c.
2. Such as have oblong Seed swelling in the Middle, and larger than the former; as Shepherds-needle, Cow-Weed, Wild Chervil, common Speignel or Meu, &c.
3. Such as have a shorter Seed; as Angelica and Alexanders.
4. Such as have a Tuberous Root; as the Earth-Nut, Kipper-Nut or Pig-Nut, Water Dropwort, &c.
5. Such as have a small wrinkled, or striated Seed; as Stone Parsley, Water Parsnep, Burnch, Saxifrage, Caraways, Smallage, Hemlock, Meadow Saxifrage, Samphire, Fennel, Rock Parsley, &c.
6. Such as have a rough, hairy, or bristly Seed; as Mountain, Stone Parsley, Wild Carrot, Hedge and Bastard Parsley, Chervil, Sea Parsnep.
7. Such as have their Leaves entire, and nor divided into Jags, &c. as Thorough-wax, Sanicle, the least Hares Ear, &c.

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10th, The *Stellate Plants* so called, because their Leaves grow on their Stalks, at certain Distances, in Form of a Star. Their Flowers are *Monopetalous*, but divided in four Segments, which look like so many distinct Flower Leaves; and each Flower brings two Seeds, which grow at the bottom of it. Of this Kind is, *Croswort* or *Mugweed*, *Madder*, *Ladies Bedstraw*, *Woodruff*, *Cleavers*, &c.

11th, The *Asperifolia*, or Rough-leav'd Plants, have their Leaves placed alternately, or without certain Order on their Stalks, they have a *Monopetalous Flower* cut or divided into five; after every Flower there succeeds commonly four Seeds; such as *Hounds Tongue*, *Wild Buglosse*, *Vipers Buglosse*, *Comfrey*, *Mouse Ear*, *Scorpion Grass*, &c.

12th, The *Verticillate Plants*, says Mr. Ray in his *Synopsis Methodica Stirp. Britann.* have the following certain Marks, or characteristic Notes, viz. that their Leaves grow by Pairs on their Stalks, one Leaf right against another; their Flower is *Monopetalous*, and usually in the Form of an *Helmet* or *Hood*; each Flower brings four Seeds usually, which have no other Seed Vessel but the *Perianthium*; for that Mark of their Flowers growing in Whirls about the Stalks, as they do in the *Dead-Nettle*, *Hore Hound*, &c. is not found in all Plants of this *Genus*; to these belong *Mother of Thyme*, *Minth*, *Penny Royal*, *Vervain*, *Wood Besony*, *Self-heal*, *Ale-hoof*, *Bugle*, *Scordium*, *Motherwort*, &c.

13th, Such as have many naked Seeds (at least more than four) following their Flower, which therefore they call *Polysperma*, *Plan-*

ta, Semine Nudo. By the Words *Semine Nudo* or naked Seeds, they mean such as are not included in any Seed Pod, or Case, out of which they readily drop ; but such as either have no Covering for their Seeds, or else drop off with their Covering upon them. Of this Kind are *Pilewort*, *Crowfoot*, *Marsh-Mallows*, *Avens*, *Strawberries*, *Cinque-foil*, *Tormentil*, *Meadow-sweet*, &c.

14th, *Bacciferous Plants*, are such as bear Berries ; as *Bryony*, *Dwarf-Honeysuckle*, *Butchers-Broom*, *Solomons Seal*, *Lilly of the Valley*, *Nightshade*, *Asparagus*, *Whorts* or *Whortle-Berries*, &c.

15th, *Multifiliquous*, or *Corniculate Plants*, are such as have after each Flower, many distinct, long, slender, and many times crooked Cases, or *Siliqua*, in which their Seed is contained ; and which, when they ripen, open of themselves, and let the Seeds drop out : Of this Kind is the *Common Hensleek*, *Orpine*, *Navelwort*, or *Wal-pennywort*, *Bearsfoot*, *Marsh-Marigold*, *Columbines*, &c.

16th, Such as have a *Monopetalous Flower*, either *uniform* or *disform*, and after each Flower a peculiar Vessel or Seed Case (besides the common *Calyx*) containing the Seed, and this often divided or parted into many distinct Cells. These are sometimes called *Vasculiferous Plants* ; such as common *Henbane*, *Marsh-Gentian*, *Bindweed*, *Throatwort*, *Rampions*, *Toad Flax*, *Fox Glove*, *Red Rattle*, or *Cocks-comb*, *Eye-bright*, &c.

17th, Such as have an *uniform Tetrapetalous Flower*, but bring their Seeds in oblong *Siliquous Cases* ; as *Stock-gilliflowers*, *Wall-Flow*
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ers, common *Whitloe Grass*, *Jack by the Hedge*, or *Sauce alone*, *Mustard*, *Charlock*, or *Wild Mustard*, *Radish*, *Wild Rocket*, *Ladies Smock*, *Scurvy-Grass*, *Woad*, &c.

18th, *Vasculiferous Plants*, with a seeming *Tetrapetalous Flower*, but of an *Anomalous*, or uncertain Kind; for this Flower, tho' it be divided in four Segments, is nevertheless *Monopetalous*, and falls off all in one; such as *Speedwell* or *Fluellin*, *Wild-poppy*, *Yellow-Poppy*, *Loose-Strife*, *Spurge*, and *Plantain*.

19th, *Leguminous Plants*, are such as bear Pulse, with a *Papilionaceous Flower*. Their Flower is *difform*, and almost in the Form of a *Butterfly* and *Wings* expanded, (whence it has the Name *Papilionaceous*) consisting of four Parts, joined together at the Edges; such as *Pease*, *Vetches*, *Tares*, *Lentils*, *Beans*, *Liquorice*, *Birds-foot*, *Trefoil*, *Restharrow*, &c.

20th, *Vasculiferous Plants*, with a *Pentapetalous Flower*, like the sixteenth or eighteenth Kind, have besides the common *Calyx*, or *Cup of the Flower*, a peculiar Case containing the Seed, each Flower consisting of five Leaves or Petals; such as *Maiden Pinks*, *Campions*, *St. Johns-wort*, *Male Pimpernel*, *Chickweed*, *Crane-bill*, *Flax*, *Primrose*, *Periwinkle*, *Centory*, *Wood Sorrel*, *Marsh Trefoil*, &c.

21st, Plants with a true *Bulbous Root*, which Root consists of but one round Ball or Head, out of whose lower Part or Basis there shoot out many Fibres or Strings to keep it firm in the Earth; the Plants of this Kind, when they first appear, come up with but one Leaf, and the Leaves are nearly approaching to those of the Grass Kind; for they

have no foot Stalks, and are long and slender. The Seed Vessels are divided into three Partitions; and their Flower is usually *Hexapetalous*, or seemingly divided into six Leaves or Segments; such as *Garlick*, *Daffodil*, *Hyalacinth*, *Saffron*, &c.

22. Such as have their Roots almost like *Bulbs*. These emit at first coming up but one Leaf, and in Leaves and Flowers have some resemblance of the true *Bulbous Plants*; such as *Flower de Lis*, *Cuckoo-pint*, *Orchis*, *Broom Rapé*, *Bastard Hellebore*, *Tway-blades*, *Winter-green*, &c.

23. *Culmiferous Plants*, with a grassy Leaf, and an imperfect Flower, are such as have a smooth hollow jointed Stalk, like *Straw*, with one long sharp pointed Leaf at each Joint, encompassing the Stalk, and set on without any Foot Stalk: Their Seed is contain'd within a chaffy Husk; such as *Wheat*, *Barley*, *Rye*, *Oats*, and most kind of *Grasses*; the *Straw* of the *Wheat* and *Barley* has four Knots each from the Root to the Ear.

24. Plants with a grassy Leaf, but not *culmiferous*, with an imperfect or staminous Flower; as *Cypress Grasses* and *Rushes*, *Cat-tail*, *Bur-Reed*, &c.

25. Plants, whose Place of Growth is uncertain and various; but chiefly *Water Plants*, as the *Water Lilly*, *Water Mill Foil*, *Water Wort*, *Pepper Grass*, *Mouse Tail*, *Milk-wort*, *Dodder*, &c.

There is also another common Division of Plants into *Trees*, *Shrubs*, *Under-Shrubs* and *Herbs*, which I shall mention in some other Papers, for the sake of those who have not had

had Education enough to read the original Works of the *Botanical* Authors with Ease and Pleasure: In the mean Time, for the more easy understanding of this Account of the several Genus's of Plants, I shall explain a few Words mention'd in it. As first, what is meant by the *Petala* of Flowers. The late curious and indefatigable Mr. *Petiver* thought it proper to make an *English* Term of the *Petala* of Flowers, by calling the Leaves of a Flower the *Petals* of a Flower, for, as he observ'd, if a Person was to ask for Rose Leaves, they may be as well the green Leaves of the Tree, as the Leaves of the Flower; for which reason, where *Petals* are used, either by him or my self, they are to be understood the same as *Petala*, or the Leaves of a Flower, as the *Greek* expresses; but because most Flowers abound in *Petals*, or have more than one, so there are proper Terms to signify the Number of those *Petals*, which are usually mention'd by *Botanical* Authors, where their Numbers are express'd in *Greek*. First,

Monopetalous is a Term used for a Flower that has but one Leaf, or has but one *Petal*, as the *Campanula* or *Bell Flower*; so call'd, because the *Petal* or Leaf of its Flower is of one Piece, like the Figure of a Bell.

Dipetalous signifies a Flower which has but two Leaves or *Petals*.

Tripetalous is a Term for a Flower with Three Leaves only:

Tetra-petalous expresses a Flower with Four single Leaves or *Petals* only.

Penta-petalous, a Flower with Five single Leaves or Petals.

Hexa-petalous, a Flower of Six distinct Leaves or Petals ; for the *Bell Flower* is notch'd on the Edges of the Blossom, and many others have their Blossoms cut or notch'd within a small way of the Bottom ; yet as these Notches do not part the Blossom into so many distinct Leaves, it remains still a *Mono petalous Flower*, or may be said to have but one Petal.

Poly-petalous signifies a Flower that has many Leaves without any certain Number. As,

Poly-sperma signifies any Plant which bears many Seeds, without expressing a certain Number ; so

Polyanthos is a proper Term for a Plant that brings many Flowers, which is the true Meaning of the Word.

As Occasion offers, I shall from Time to Time explain a few Terms of this Kind ; but at present I proceed to offer an Account I have lately receiv'd of the Oeconomy of *Bees*, taken from some Memoirs of the Royal Academy of *Paris* ; it gives us many curious Accounts of the Progress of those little Creatures from the beginning of their Building, to the finishing their Work, which I believe will not be unacceptable to the Reader.

Of

Of B E E S.

TH^{O'} the Reputation of *Bees* be never so ancient and well establish'd, yet they have not been esteemed to be such wonderful Creatures as they really are; and the same may be said of them as has been concerning Persons of Merit, that they gain by being known. *M. Maraldi*, who has with much Attention and Assiduity, made his Observations upon them for a good Number of Years, has given us a very advantageous and very well circumstantiated Account of them; from whence we shall remark what appears to be of the most Importance, and most easily to be understood.

The Bee gathers both Honey and Wax from Flowers, but not with the same Organs; but as Honey is a liquid Substance proceeding from Flowers, by way of Transpiration, the Bee sucks it with her Trunk from the Bottom of the Cup of the Flower, and she applies her self to none that are deeper than her Trunk will reach, when her Body is at full Length; for she goes double at other Times, when she does not gather Honey. This Liquor is deposited in a small Bladder, that is so transparent, that you may see the Colour of the Honey thro' it; one Part of it serves for the Nourishment of the Insect, we shall account for the other by and by. As for the Wax, which is the Dust of the Stamina of the Flowers, the Bees gather it with the two foremost of their six Legs, and convey

vey it into a small Cavity, between the two hindmost : They often work and compress it with their Legs, to the end that they may carry off no small Particles of Wax, by the Means of those Hairs, wherewith their Bodies are cover'd all over.

When the Bee returns with her Harvest to the Hive, she either lays it up her self presently if she can, or else she is sure of having the Assistance of others to do it.

The gathering of the Wax is in order to make the wonderful Edifice we call a Honey-Comb ; Bees have been ever admir'd upon that Account, and indeed they are more to be admir'd than can well be imagined. The Hexagonal Form in making the Cells of their Honey-Combs, deserves the Observations of the best Geometricians, who know as well that such a Number of these Figures as they have a Mind to, will fill Space without leaving any Vacuity therein, as that this Figure which has that in common with a Square and equilateral Triangle, has a manifest Advantage of including a greater Space within the same Compass. Nevertheless, the choosing of the Hexagonal Form is not all ; for of all the Geometrical Ways by which it may be done, they have at the same time pitched upon that which is plainest and most commodious for them, and consequently have made a very ingenious Choice ; what could the best Geometrical Artificers do more ? The Account of building these Hexagonal Cells, which M. Maraldi has observed with very great Curiosity, was never known before : It has nothing in it like the Conjecture
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set down in the History of the Royal Academy for the Year 1711, p.24, &c. That exceeds the Genius of these small Insects, is too Geometrical, and too much complicated to have Room here.

Tho' the continual Motion of several Thousands of Bees in the Hive seems to be irregular, and as it were by Chance, yet, in the main, they observe great Order; but it is what ought to be studied carefully. Their Labour is distributed in the same manner, as among the Beavers: Those Bees, who carry the Wax between their Jaws, and perhaps distil some Liquor which moistens and mollifies it, sometimes are the same that with this Wax build the little Walls of the Hexagonal Cells; others sometimes perform this Work; but those who form the Cells, are not the same that polish the Work. There are others who succeed them in this Affair, whose Business it is to make the Angles more exact, to close and smooth the Superficies, and to put the finishing Stroke to the whole; and as this cannot be done without paring off some small Pieces of the Wax, there are those whose Business it is to take up and save these Particles, that nothing may be lost. *M. Maraldi* has observed, that the Bees which build the Walls, do not work so long together as those that polish them, as if the Business of polishing were less fatiguing than the other.

The Diligence of these little Animals is wonderful; a Honey-Comb of a Foot long, and six Inches broad, which contains four thousand

thousand Cells, is dispatch'd in one Day; but then there must be a Concurrence of all favourable Circumstances.

They fasten a Honey-Comb to the Top of the Hive, from whence it descends downwards, provided that the Top be not a Cover or Lid, which may be taken up; if so, they will discern it, and fix their Comb else where: It's not properly the Wax they make use of to fasten it.

As the Honey-Combs form Plans that are perpendicular to the Basis of the Hive, which I suppose to be circular, should there be such an one whose Basis makes a Diameter, or entire Cord of this Basis, it would divide the Hive into two Parts, so as to have no Communication with one another: The Bees foreseeing this Inconvenience, will not extend their Honey-Combs so much, but will leave an Interval between the two adjoining Combs, which are almost in the same Plan, thro' which two of them can pass a-breast; besides, they will leave some Openings in the same for Honey, that they may not be obliged to go so much round about. Thus you have a City built with very good Understanding.

The Cells in the Honey-Combs are design'd for two Purposes. 1. They are their Magazines: There they lay up the Honey, which is to be their Food in Winter; for as to that which they suck from the Flowers, and which they deposit in that little Bladder before-mention'd, there is but a small Share of it expended in their present Nourishment: The rest, when they return into the Hive, they

they lay up for a Store; besides, they keep in the Cells already made the Wax they should use, wherewith to make more, or which they reserve for some other Purpose. 2. The Cells are the Cradles of their Young; but from whence do these young ones proceed? This is a difficult Task to unravel.

The fabulous Traveller, who speaks of a Nation, where there was no Distinction of Sexes, and where we could not discover how they were propagated, might take this Notion from Bees; and *Virgil* was not in the wrong, when he commended their Chastity; and likewise believed the Story of the Bull, for want of a better. Of all the Inhabitants of an Hive, consisting of eight or ten thousand Bees, perhaps there is no more than one that produces young ones; he is longer bodied, and of a mote lively Colour than the rest; he has a grave and composed Gate: This is the Bee they call the King [others say the Queen.] Sometimes there are two of them, or at most but three of this Kind, to be seen in a Hive; and this is it that makes it dubious, whether there is any more than one that has the Knowledge of Generation. However, 'tis certain, according to the Observations of M. *Maraldi*, that it belongs to no other than this Royal Race; all the rest of the People are destined to Barrenness. The King, for the most part, deposes his young ones in those Parts of the Hive where he cannot be seen; and if he pitches upon others that are more exposed to view, yet, generally speaking, it is very difficult to see him, because the Bees draw a Curtain be-

fore him : This Curtain they form by suspending themselves from the Top to the Bottom, and sticking to one another by the Help of certain small Hooks that are on their Legs; they can by this means form what Figures they please in the Air. The King hides himself in this manner, either by way of Precaution on the Account of his Young, or perhaps out of Modesty ; for there is nothing which we may not suppose of Bees : However, he could not always escape the Sight of *M. Maraldi* ; he has seen him with his Train, and always with a grave Air, going to lay in eight or ten Cells one after another, as many little white Worms, which in Time become Bees: It appears when he is a Laying, by certain particular Motions of the Bees that compose his Court, they caress, applaud or encourage him ; after which, he retires into the inner Part of the Hive, from whence he does not come out.

We may judge, by the eight or ten Worms one after another, which he lays in so short a Time, and by the Circumstances in which he appears, how prolifick he must be during the whole Time he is not seen, that is almost the whole Year : It must be prodigious. When he is alone on the Hive, and he is generally so, he is the only one that produces: One Swarm at least, which may consist of twelve or fifteen thousand Bees, proceeds from this Hive, and sometimes two, nay three ; and yet it is as full at the End of Summer, as in the Beginning of the Spring ; a new Swarm therefore, if it be the only one of that Year, must needs be the King's Family, supposing it consists

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sists only of young Bees; and in Case any of the old ones are amongst them, there will remain in the Hive almost as many Bees. It's not likely that the King, that goes out of the Hive with the new Swarm, has produced part of the Bees which accompany him; but if the Hive yields more than one Swarm in a Year, they must needs be a new Brood of the old King's, unless, that he may prevent the Consumption of his Prolifickness, you would suppose he has produced more than that one King that went out with the first Swarm, and that one or two more remain'd in the Hive, and there bred their Young: If so, a King may go out with all the new Swarm he has produced, and so become literally the Father of his People; whereas the other Kings are no more than Brothers, because they come from the same Bee: Take it which way you will, these small Animals have the singular Privilege, that Nature herself bestows a King upon them.

It remains now that we should inquire from whence this Prolifickness comes, and whether it be not from some Copulation: There is scarce any Hive wherein Drones are not to be found; nay, sometimes several Hundreds of them: They are of the same Make as other Bees, but they are very near one third longer and thicker, and have no Sting: They bear nothing of the industrious Character of Bees, but continue wholly idle: They go very little out of the Hive, unless it be very fair Weather, and they soon return, and bring nothing with them; not but that their Bladder is full of Honey, but

it is to be suspected that they have robbed the Hive, because they are never seen to alight upon Flowers; and should they go to suck Honey from them, it would be only for themselves, and not for the Benefit of the Publick: For *M. Maraldi*, in pressing their Bladder, found nothing come out as from that of Bees; thus the Drones cannot discharge it. One would think that these Animals were the Males of the great Bee or King, and that they were not suffer'd to continue in the Hive, but upon the Account that their Idleness were sufficiently recompenced by that important Function; and that which gives Countenance to this Notion is, that the Bees at the End of the Summer make a cruel War against the Drones, kill 'em, drive 'em out of the Hive without any Quarter, and we know not what becomes of them afterwards. The Cause of their Misfortune seems to proceed from their being become absolutely useless, because they do not generate in Winter; but what carries with it a great deal of Difficulty is this, that *M. Maraldi* has seen several Hives without a Drone in them in Summer, and during the Time when the Cells were well supply'd with small Worms.

The Generation of Bees indeed still remains much a Mystery; but the Care which they take all of them in common of the young ones, which they do not produce, and which belong to no other than their King, is exceedingly visible, and very remarkable. It may be said, that they are consider'd as the Children of the Government: Every little Worm has some Drops of Liquor put into
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its Cell for its Food, after which they make a Wax Cover for the Cell; these different Operations have their stated Times. We will leave this Matter to *M. Maraldi*, as well as that of the successive Growth of the Worm; which coming at last to a Bee, makes her Way thro' the Cell, and after some time of Languishment, takes her Flight with the rest. It is to be observed, that Bees have the Spirit of good Management to that degree, that they will not suffer this Lid or Cover, thro' which the young ones have made their Way, to be lost; they go and fetch the Wax, and carry it into a common Magazine, that it may serve upon other Occasions; they do at the same time put the Cell into its regular Form, if it be any Ways disorder'd, and repair it that it may serve for the same Use. You will have in the same Cell five Broods of Works successively, during the Space of three Months.

The Drones are the Offspring of the King, as well as the Bees; there are in the Honey-Combs some Cells that are larger than others, and design'd for those Worms, which become Drones, and consequently require more Room: These Worms are laid by the King with the same Ceremony, and afterwards treated by the Publick with the same Care as those that become Bees. All Things go well till the End of the Summer; but then the Bees declare War against the Drones, and their Fury transports them so far, as not to spare those that are but Worms; they break the Covers, which they themselves had made for the Cells, wherein they are inclosed, and pulling

pulling them out to kill them, throw their little Carcasses out of the Hive: A Change that is difficult to be comprehended in so wise a Nation.

IT may be necessary before I finish this Month's Papers to insert the following Letter, that some of my Readers may act with the same Spirit in trying of Experiments, as the curious Author of it has done at *Newcastle*. What extraordinary Experiments I have made and mentioned in my Works, are now in Practice by several ingenious Men, and promise so well, that I shall be able very soon to publish them, with the Improvements which have been made upon them; and likewise what Success the Trials after Dr. *Agricola* meet with, which I have now under Care.

In answer to Mr. *Heslop*, and many others who have a Mind to propagate the *Caper*, it is necessary to acquaint them, that they grow commonly about *Thoulon*; but as that Place has been lately attack'd with the Plague, I judge the properest Place now to get them from is *Leghorn*, where I doubt not but some Seed may be had if we send for it before *Christmas*; but, at present, there is none in *England*, unless it can be found upon those Plants which I rais'd about four Years ago, which have been in Blossom all this Summer. If we can get it, we must keep it till *March* before we sow it. To give a further Answer to Mr. *Heslop*, and some other ingenious Persons who have writ to me about Bees, it is also necessary to inform them, that I have now by me several curious Pieces relating to
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those wonderful Insects, and the Management of them and their Colonies, which I shall insert in the following Months. What I have inserted concerning Bees, in this Month's Papers, may serve by way of Introduction to them: But we come now to the Letter I promis'd, which I hope may lead others to make the same Experiments; for tho' some may fail in one Place, they may succeed in another.

To Mr. BRADLEY.

S I R,

Newcastle upon Tyne, Sep. 26. 1721.

I Have been one of your Readers and Admirers for your Industry in collecting, reasoning upon, and handing down to us whatever I believe is of any valuable Use, in *Agri- and Horti-Culture* at home or abroad, and this both from the Ancients and Moderns. And seeing you invite Persons to communicate any Trials relating to either, I shall only now tell you, that this last Summer, I raised Seeds of Oranges and Lemons in a hot Bed but very late (I think I begun not till *June*); I anointed some of them with soft Soap before I set them, also watered them with Soap-Water; the Effect was, that the soaped Seeds came up first, and the Lemon Seeds, I think, a Week at least before those unsoaped, or the Orange;

towards

' towards the Middle or latter End of *August*,
 ' they had about four or five Leaves besides
 ' the Seed Leaves, upon which I grafted
 ' some of them with the tender Cyons of an
 ' Orange-Tree, in the Method you mention
 ' that Mr. *Curtess* useth. My grafting Wax
 ' was only Bees-Wax, brought to a Consi-
 ' stence with fine Turpentine, (for I had not
 ' then seen *Agricola's* grafting Mummies) but
 ' they all failed me, whether by over-hard
 ' lying with Jersey, or the Turpentine was
 ' too hot, (for I since find, as *Agricola* tells us,
 ' it ought to have its finer Spirits evaporated
 ' by Heat). I also used soft Soap as you ad-
 ' vise to young Shoots of Vines, which took;
 ' I tried it also upon Slips of *Brussels* Apri-
 ' cots, Peaches, Nectarines, Paradise Stocks, &c.
 ' but without Success; only some Cuttings of
 ' the Passion-Tree, plain Myrtle, and spotted
 ' Phyllorea have, I think, so taken, that they
 ' will hold by houseing: I shall, if I live to ano-
 ' ther Year (for I am now entring upon my
 ' 77th Year) try some other Experiments. I
 ' caused about last *November* several Holes,
 ' with a round Iron, to be made betwixt the
 ' Joints of the large Stones, of which our
 ' firm and solid Town Walls are built; for
 ' I have two hundred Yards or more for a
 ' Fence to the *Northward* of my Garden; and
 ' put into each the Root of a small Vine
 ' raised from short Cuttings the Year before,
 ' with a little fine Earth in each Hole; two-
 ' thirds at least, or rather more (for I find
 ' those I thought had not taken, are just now
 ' putting forth Buds and Leaves) grew, and
 ' are hopeful; I am therefore thinking, if I
 ' could

' could, get some Caper-Seeds of your Tri-
 ' als, about which you give so good an Ac-
 ' count, that they may perhaps take with
 ' me; but not knowing where to have them,
 ' unless your *Italian* Gardener, you mention
 ' in your Improvements for *April*, can furnish
 ' me with them; or, if he have none, if you
 ' would please either to leave Word with
 ' Mr. *Peele* where I may buy them, or to pro-
 ' cure some of your Acquaintance that sends
 ' to *Italy* yearly for Seeds, as you tell us, to
 ' get me some, I shall get one to call upon
 ' him to know where I may get them, as also
 ' for some Sprout Colliflower Seeds, and you
 ' will therein greatly oblige me, more especial-
 ' ly if you can inform me Dr. *Douglass's* Way
 ' of propagating Mistletoe; for I have tried
 ' two Winters in vain: As also, if you have
 ' any Thing in short about Bees, which I
 ' am for planting a Colony of, but so as
 ' not to swarm yearly as in the common
 ' Method, and yet in Wood and Glass-hives,
 ' which I hear some some about us have tried,
 ' but not successfully; that Method, I think,
 ' being too cool for our Climate, but perhaps
 ' by Straw-hives of another Shape may
 ' succeed. I had some Potatoes from *Bermu-*
 ' *das*, the last of which pleased me greatly;
 ' I set some of them in *July* as soon as I
 ' received them; they are but newly come
 ' up, but whether they will stand this Winter
 ' or no, I know not. This, Sir, is what oc-
 ' curs at present; but shall, God willing, next
 ' Year try *Agricola's* Mummies, &c. as also
 ' some Things helping Vegetation, mention-
 ' ed in *Glauber's* Works; as also an oily, vo-

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' latile

‘ latile vegetative Salt, mentioned by Dr. Bore-
 ‘ have of Leyden, in his College of Chymi-
 ‘ stry ; of which as also of any Trials you’ll
 ‘ recommend to me, I shall think my self ob-
 ‘ liged to give you an Account, if you answer
 ‘ this, by directing to me in *Newcastle*, which
 ‘ is sufficient. I am, S I R,

Your assured Friend and Servant,

ROBERT HESLOP.

To Mr. BRADLEY.

S I R,

‘ NOT long since I had the Happiness of
 ‘ having some Conversation with you, at
 ‘ which Time you was pleas’d to give me
 ‘ some Account of the Physick Garden at
 ‘ *Amsterdam*, with the numerous Variety of
 ‘ Plants with which it is stock’d ; which has
 ‘ caused me to reflect within my self of the
 ‘ Negligence of our Nation in that Affair,
 ‘ notwithstanding their Industry in the Know-
 ‘ ledge of the Works of Nature is so great,
 ‘ that I believe scarce any Nation in *Europe*
 ‘ can equal it ; yet this, which, I think, may
 ‘ redound to the Honour of the Nation in
 ‘ general, and the Company’s in particular,
 ‘ who are engaged in the Support of our pub-
 ‘ lick Gardens, is wholly neglected, either
 ‘ for Want of a Spirit in the Supporters, or
 ‘ from the Negligence of the Persons em-
 ‘ ploy’d. How is that Garden at *Oxford*, so
 ‘ much extoll’d formerly, now run to ruin ;
 ‘ and likewise that well situated Garden at
 ‘ *Chelsea* so much confused, that instead of
 ‘ inviting Persons to see it, it rather gives
 ‘ them

' them an Aversion to a Garden. But indeed
 ' this is not our Case in general ; for we
 ' have some noble Patrons, who, at their own
 ' proper Cost and Charge, have erected some
 ' considerable Gardens in private to them-
 ' selves, as Dr. *Lloyd*, Dr. *Sherrard*, Mr. *Dubois*,
 ' Dr. *Udal*, and others ; and I could wish their
 ' Example might be followed in our publick
 ' Gardens, which, I think, in a short time, might
 ' be made to excel most Gardens in *Europe*, if
 ' a regular Method was taken: Accordingly I
 ' shall give some small Hints of my Thoughts,
 ' which Way they ought to be regulated.

1. ' I would advise, as it is lay'd out in
 ' Quarters, that each Quarter be well wrought
 ' and mark'd out in Beds, and that each Bed
 ' have the Plants of one Genus class'd in it,
 ' and the distinct Species be mark'd in that
 ' Bed, to concord with a Book wherein an
 ' an exact Account of the Plants in each Bed
 ' should be kept as they are classed, that there
 ' may be no Confusion among the Plants,
 ' but that they may readily be found with-
 ' out running up and down to search them out.

2. That those Quarters which are full of
 ' large Trees be digg'd up, in order to dis-
 ' pose of such Plants as are natural to Woods ;
 ' that each Plant be rightly situate to its Po-
 ' sition and Nourishment, for Want of which
 ' abundance of Plants are lost ; for certainly
 ' should we strip a Man of his Clothing, and
 ' send him naked to feed on Grass, he would
 ' soon let us know it was contrary to his Na-
 ' ture, and therefore could not live ; and, I
 ' think, it is the same with Plants, which
 ' always require a Position and Soil a-

agreeable to that from which they were taken.

3. ' In that Journal Book, or some other, a List of all the new Plants that should from Time to Time be brought in, with an Account from whence collected, with the Names of the Persons, who by their Industry should collect them, that those who should be most industrious might have due Respect shew'd 'em.

4. ' That there might be Provision made to maintain aquatick Plants.

5. ' That there might Provision be made to bring the Ananas and Guavas, with some other choice Fruits, to Perfection.

6. ' That some odd Part of the Ground be employ'd to make Experiments, and that the Gardener keep an exact Account of his Experiments; as likewise of his Seeds which he sows, whether exotick or domestick, with a Weekly Account of their Progress.

7. ' That annually towards September there be a general Meeting of the Companies or Masters, and that then the Gardener give in before them the whole of his Journal, which I think may not prove a little advantageous in forwarding Gentlemen in their natural Studies.

8. ' These, I think, with some other Methods too tedious for me to relate here, if rightly put in Practice, might redound much to the Honour of the *British* Nation, and the Instruction of young Students, the which if you please to insert in one of your monthly Books, may stir up some of our Great Men to put in Practice what they shall judge to be agreeable; and in so doing you will much oblige yours

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Remarks upon the Weather and the Produce of this Month.

THE Weather at the beginning of the Month was warm, the Wind *West*; about the fifth Day the Wind chop'd about to the *North* and *North-East*; the Weather moderate and dry till the thirteenth, when we began to have some gentle Showers; the Wind then changing to the *West*, remain'd about that Point till towards the End of the Month, excepting only a Day or two that it was changeable from *North* to *North-East*, and touching sometimes upon the *South*. While the Wind was Westerly I observed we had frequent Rains, but whilst it was shifting in the other Quarters the Sky was clear. All this time, however, we had not the same Reason to complain of Cold as we had in the preceding Month, though we are used to expect some Cold about St. Bartholomew's Day. The Spirit in the Thermometer was then about 34 Degrees, and towards the End at 43.

We had now ripe the best *Peaches* and *Nectarines*, some *Apricots*, many sorts of *Pears*, *Apples* of various kinds, *Plums*, some *Morello Cherries*, some *Rasberries*, *Goosberries* and *Currants* in plenty. *Mulberries* began to ripen apace; *Figs* of Five or Six sorts, some of the *July*, *Sweet Water* and *Burgundy Grapes* ripen'd where they had the Advantage of good Walls and good Pruning; and about the End I saw some of the *white Muscadine*, *black Currant* and *black Cluster Grapes* pretty near ripening against good Walls: and in Mr. Warner's Vineyard in Rotherhith, I observed some
of

of the *July Grape* in *Espalier* full ripe, and the *Burgundy* kind beginning to turn.

And as this Month is commonly the Time of the Year when Grapes and other choice Fruit should, according to the regular Course of Seasons, be ripe in their full Perfection, I shall take the Opportunity of mentioning a Contrivance of the late Lord *Capel's*, for the preserving them from Flies and other Vermin, which are now more numerous than at any other Time of the Year: The Way is to prepare Bags of Crape, Lawn, or of any other thin and open wrought Stuff, to be extended by small Hoops; which Bags being put over the Fruit, not only preserves it from being injured by Vermin, but suffers the Air and Sun to perform the Act of Maturation or Ripening: But as soon as the Frosts begin, these Bags are of no longer use; which is so plain a Thing that I should not mention it, if I had not seen them indiscreetly used with a Design to keep the Frost from the Fruit. This is Indiscretion, because whoever knows the Nature of Fruit, or of Grapes especially, must know, that when the Frosts touch them, the Skin of the Fruit thickens and sowers; and it is as certain, that where Air can enter, the Frost can do the same, and will spoil the Fruit; therefore it is more reasonable when our Grapes are full ripe, and we expect frosty Nights, to cover every Bunch with Paper, after having pick'd and clear'd them of the rotten Grapes; such Bunches may remain upon the Vine till *Christmas*, and will then eat very well.

If we cut down a Bed or Two of *Asparagus*
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Haulin, at the beginning, we may expect it to Sprout again with good Buds about the Middle of the next Month ; but especially if we open the Alleys and lay into them a little hot Dung.

I observed in the Markets plenty of Melons and Cucumbers, Kidney Beans, Onions, Schalotts, Rocambole, some Beans and Pease, Collyflowers, Cabbages, and fine Sprouts of the forward Cabbages, Turneps, Carrots, some forced Salary, Cabbage Lettice, Philberts, Walnuts and Damsons ; but Mushrooms, which are usually the Produce of the latter part of this Month, were very scarce ; which Scarceness I conceive might proceed from the Wet and Coldness of the Summer Months ; for when we have had a dry and hot Summer, I always have taken notice, that as soon as the first Rains fall upon the scorch'd Ground, Mushrooms spring up plentifully in such Places where Horses have been grazed the same Summer ; but this Year some Pastures, which used to afford great Abundance, did not produce any, although Horses had grazed in them this Year as usual. And I was the more diligent to search for them for the sake of the Earth under them, which seems to be bound together with white Cobweb-like Threads: This Earth I sought for, in order to propagate by its means some Mushrooms in hot Beds, according to the Method used about *Paris*, where they may be had every Month in the Year.

The *West-India Pine-apples* or *Ananas* continue ripening at Sir *Matthew Decker's* at *Richmond*.

To conclude this Month, which is the chief Fruit Season, I think I cannot do it more properly

perly than by prescribing a proper Method for transporting of Fruit from one Place to another, so that it shall receive no Damage, though it pass over the most rugged Ways.

For this use we must provide a Box and as much Bran as will fill it compleatly, which Bran must be carefully dry'd before a Fire, and often turn'd in the time of drying; for if there is Moisture left in it, it will be apt to ferment, by lying a few Days press'd together. The Fruit should be tenderly gather'd when the Sun has perfectly dry'd it; and lay'd upon dry Flannel till the Day following, when it may be pack'd up in the following manner;

Lay an Inch or Two thick of Bran at the Bottom of the Box, and after it is well press'd down lay on your Fruit single, so as not to touch each other, but leaving about an Inch Vacancy. Between the Fruit these Vacancies must then be closely fill'd with Bran, and the Layer of Fruit cover'd with Bran about two Inches, press'd gently down: upon this place another Parcel of Fruit, ordering it as before, and Bran upon that, and so *stratum super stratum*, or Layer upon Layer, till the Box is full, always having regard that the upper Layer is Bran about two Inches thick, even so as to give great Resistance to the Cover of the Box when we nail it down; for so the Fruit will be kept tight in the Box, and cannot bruise or receive Damage by a Conveyance of three Weeks, as I have proved; some, who are very curious, use instead of Bran, fine Wood Ashes well clear'd from every Part of the Coat, which is rather better than Bran for a long Voyage, but are not so easily found near London.

The End of the Month of August.



A GENERAL
T R E A T I S E
O F

Husbandry and Gardening,

For the Month of *September.*

CONTAINING

Such Observations and Experiments as
are New and Useful for the Improve-
ment of Land.

WITH

An Account of such extraordinary In-
ventions, and natural Productions, as
may help the Ingenious in their Stu-
dies, and promote universal Learning.

*To be continu'd Monthly, with Variety of
curious CUTTS.*

By R. BRADLEY, *Fellow of the
Royal Society.*

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Printed for J. PEELE, at Locke's Head, in
Pater-Noster-Row.

(Price One Shilling.)

THE
TREATISE



Husbandry

For the Month of September

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An Account of such extraordinary In-
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direct, and promote the Improvement.

To be continued in the next Volume of the

R. R. B. ADLER, (Printed by the
Royal Society)

Printed by J. Sturges, at the Sign of the
Three Kings, in St. Dunstons Church-yard, near
St. Dunstons Church, in the City of London.

To the Honourable
Sir *William Thompson*, Kt.
Recorder of the City of *London*, &c.

THIS
T R E A T I S E
O F

Husbandry and Gardening,
For the Month of *September*,
Is, with the greatest Respect,
Most humbly Inscrib'd by
His most Obliged
Humble Servant;

R. Bradley.

To the Honorable
Sir William Thompson, Kt.
Recorder of the City of London, &c.

THIS
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1862

Husbandry and Gardening.

For the Month of September.

With the greatest Respect,

Most humbly Incribed by

His most Obedient

Humble Servant,

R. Bradley.



A GENERAL

TREATISE

OF

Husbandry and Gardening,

For the Month of *September.*

Observations relating to Cows, their Food and Pasture; and how far the Goodness of Milk, Butter and Cheese may depend either upon the Kind of Cattle, the Soil where they are grazed, or the Management in the Dairy.



Observe only three Sorts of Kine in England, which are remarkably different in their Colour, viz. the black, the white, and the red.

The black Sort is commonly the smallest, and it has been observed is the strongest for Labour; we find Cattle of this Colour

Colour chiefly in the mountainous Countries, where they are still much smaller than when they enjoy the free Nourishment of the low rank Grounds; but yet I have never observ'd them of so great a Stature or Bulk of Growth, when even they have had the richest Pasture, as is common in the white and red Kinds: And it is a Remark of the old Authors not unworthy our Observation, that the black Kine about sixty Years since were chiefly bred in *Cheshire*, *Yorkshire*, *Lancashire*, and *Darbyshire*; which Counties chiefly supply, as I am inform'd, that large Quantity of rich Cheese, which we receive under the Name of *Cheshire* Cheese: And it is observable, that the Cows of this black Strain yield seldom more than a Gallon of Milk at a Meal or Milking; but to make us amends they continue Milcht, or in Milk, till within a very few Days of Calving, so that we can hardly say they are ever dry: Whereas the other Sorts, which are remarkable for their Colour, as the white or the red, will, after Calving, give large Meals of Milk near three Times as much as the former, but grow dry very soon.

The white Breed of Kine, according to some Remarks of a very learned Gentleman, which I have now by me, were very frequent in *Lincolnshire* about thirty Years ago, from whence he first brought them into *Surry* as a Curiosity; they are of different Make and much larger than the black Cattle, and give more more Milk at a Meal, but go dry very soon: It is observ'd likewise in the same Remarks, that many of this Breed were then in *Suffolk*; and I wish he had gone so far, as
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to have given us some Reasoning upon those coarse Cheeses, which are call'd *Suffolk* Cheese, and why they happen to be harder and drier than any in *Europe*; but we shall say more of that by and by.

The red Kind is commonly the largest of any Sort we have in *England*; and it is observ'd by some Farmers, will give more Milk at a Meal than the Cows of any other Colour: It has likewise been the Opinion of Physicians, that the Milk of the red Cow is more nourishing than that of any other Sort of Kine, as is remarkable by their prescribing it to consumptive Persons; and if I may be allow'd the Liberty of adding my own Reasons why it is so, my Opinion is, that whatever Body is luxuriant in Growth, denotes that it enjoys perfect Health, in that it draws Plenty of Nourishment from its Diet; and if an Animal, Vegetable, or whatever it be, is large and well nourish'd in its Kind, and that its Parts separately or altogether are proper Diet for any Particular of the Animal Race, the more such Bodies are vigorously nourish'd, the more nourishing they will be to whatever Creature uses them in Diet. One of my curious Correspondents observes in Animal Bodies, the black, or such as have black Hair, are generally hot and dry in their Constitution, those which have Hair of a redish Colour are fill'd with more vigorous and fluent Juices, and those which have white Hair, have a faint or weak State of Body, or declining in their Strength; the white, grey, or silver Hairs in old Persons, the golden Locks so much admired among

mong the *Grecians*, and always a Beauty in their *Venus*; with many other Remarks of the same Kind, my Correspondent gives me as Proofs, that the Quantity of sovereign Juices may be judged of in such Animals, as are chiefly distinguishable by the Colour of their Hair. This is all I shall at present take from his Letter, for the Use of the Subject I have in hand; the rest may afford matter of Contemplation another time. But to proceed upon my own Observations; wherever I have had Opportunity of examining into this Part of Farming, which relates to the Dairy, I have always found the red Cows to give much more Milk than the black Sort, where the Farmers have been wise enough to keep one genuine Breed of Kine from mixing with another, as some curious Men do now in *Somersetshire*, and the adjacent Parts; where, as I am inform'd, the red Sort of Kine was first bred, and is chiefly educated at this Time for the sake of its large Size, which will yield in the Markets for the Butchers use several Pounds Sterling *per Beast* more than the natural black Cattle. The mixing of these Sorts, I suppose, has been a Means of producing the *Pey'd* Kind, now pretty frequent, and of bringing the more lusty Race into a Degeneracy, as it has brought the dwarfish Strain to be of a larger Size than they were originally; and at the same time, the Qualities which were admir'd in either distinctly before the Coupling, are now so confounded one with the other, that their original Perfections are hardly to be traced out. The famous *Cheddar* Cheeses, which

which are so large and costly that few of them appear but in the Houses of Men of Fortune, are made in this County and the adjacent Parts, and takes its Name from *Cheddar*, a Town, as others do from *Cheeshire*, a County. 'Tis, as I am well inform'd, the Custom in some of these *Western* Parts, for all the People of a Parish to join their Milk every Day by Turns, for the making of a Cheese, which is the reason that they are so very large, and greatly exceeding the Weight of those Cheeses made in single Dairies: But whether it is the sort of Kine, or the Feed, or the Management of the Milk in the Dairy, which gives the Richness to the Cheese, we shall consider hereafter.

We may repeat as we go along, that the Red Cows do not only give, for the Generality, more Milk at a Meal than those of other Colours, but bring better Calves too, notwithstanding it has been argued on the contrary; some even affirming it was impossible that a Calf could be compleatly nourish'd in the Matrix, where the Milk was abundant in the Dam. Others again tell us, that the natural black Kind which give Milk all the Year cannot bring good Calves, because say they, where this Milk is continued during the whole Time the Cow is pregnant, it must certainly draw away the Nourishment which is requisite to feed the Calf while it is enclosed in the Matrix.

To answer the first Difficulty, I think we need go little farther than what I have said before, *i. e.* that the Red or Larger sort of Cow which gives great Quantities of Milk

at a Meal, becomes dry sooner after her Pregnancy than others ; so that when the Calf begins to grow in the Matrix, all the Juices of the Body are turn'd to its Nourishment, except such as are lost by Transpiration, or the feeding of the Hair upon the red Cows, which Hair is always said to be much stronger upon the Cows of this Colour than upon the Black.

On the other hand, though the black Cattle give less Milk at a Meal than the red Kine, yet they continue milch'd till near the Time of Calving ; which in some Cases is rather to be chosen, than a Cow which gives a great Quantity at a Meal, and goes dry soon, as I shall explain hereafter. Nor can I find any Reason why the black Cattle, which are thus constantly in Milk, should not bring a well-grown Calf ; for seeing how moderately they dispense their Milk at each Meal, we may reasonably infer that they give only what Nature allots them to spare from their Nourishment, and rather seems to be a necessary Discharge of Juices, than any Inconvenience either to the Cow or the Calf she is pregnant with : For in such a Case, the Calf will naturally draw to it self from the Mother, what Juices are necessary for its Support ; and if it requir'd more than the Cow could conveniently furnish, the Cow must then necessarily languish, and as surely lose her Milk : So that while we find Milk in a Cow, we cannot reasonably suppose, that either the Cow or Calf wants Nourishment. These natural black Cows, if they have free Pasture or are well fed, will, as I am told by some Cow-men about London, yield

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yield one Time with another compleatly six Quarts of Milk *per Diem* the whole Year about. And considering the Time that the Red Cows or such as are deep Milch'd are dry, the Milk of the Black in one Year exceeds that of the Red in Quantity; but then if this Milk is for Dairy Use, it is fortunate to have a deep milch'd red Cow to calve about the End of *March* or Beginning of *April*, that she may be come to her Milk just when the Spring is rising, and the Grass is full of vigorous and nourishing Spirits, which will greatly add to the Quantity of Milk she will give at a Meal. I have, three or four times, been Witness, that a large Cow has given in one Day upwards of Thirty One Quarts; but such Extravagance soon declines, and the Cow is unprofitable during a good part of the Year, unless we let her Calf go along with her: But this is no way agreeable to the Rules of the skilful Farmers; they value the Milk for Dairy use, while the Grass is long and rich, more than the Profits which would arise from a Calf at that Season. But when a Cow calves about *October* or *November*, the Calf may be brought up for Increase, the Milk then is not so fit for Dairy, the Calf will be more harden'd against Distempers, and thrive by the nourishing Food of the following Spring, and be much more gentle and familiar than if it had at once fallen in with Plenty at its Birth. But it is now time that I say something of the Pasture and Food of Cows, how much the Goodness of their Milk may be influenced thereby.

And, first, we must suppose that the Juices

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of every Herb are fuller of Spirits and more nourishing when they are in the Vigour of their Growth, than when the Cold puts a stop to their Vegetation ; for in some aromattick Herbs, when the Cold begins they lose their spicy Smell ; and again, when the Warmth of the Spring begins to move their Juices they regain their Odour ; which shews that by Cold, Plants lose the Spirits which by Heat they possess'd ; so that the Milk of Kine cannot be supposed to yield that Nourishment when the Cows feed on Herbs out of Growth, as it will do when Herbs are springing : And to prove that the Milk of an Animal can be influenced by Herbs simply, or by Heat or Cold, which alters them, I shall give some Instances.

First, When a Cow feeds where *Crow Garlick* happens to grow amongst the Grass, the Milk will assuredly partake of the Relish of the Garlick : I have often seen Cows feed upon it, and have as often found the Scent of Garlick in the Milk, as I have had Opportunity of using it ; which plainly demonstrates to me, that notwithstanding all the different Filtrations of the Juices through the Body of the Animal, yet it is necessary in Nature, that every part of the Body must draw some Nourishment from the Diet of an Animal, or the Food which every Creature receives into the Stomach, and that the Herbs which Cows feed upon either meliorate or hurt their Milk.

Secondly, At the Time of the Year when the Leaves fall, we find the Milk of those Cows which feed upon them is bitter to the Taste,

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Taste, and is very apt to turn or change ; so that we may reasonably suppose, that the falling Leaves have an Influence over their Milk. It is not uncommon to see Cows feed in this manner, nor is it more rare to find Milk influenced at that Time, as I have said ; but whether it be from the Leaves in general that fall and then tend to Maturation, or from Leaves of particular Plants, may be consider'd hereafter.

Thirdly, About *Autumn* it is customary near *London*, to feed the Cows with Turneps of a large Kind, commonly call'd the *Cow Turneps*; and these are used in many Places with Indiscretion, by giving the Cows both the Leaves and the Roots, as they are fresh drawn from the Field; the Milk in this Case will likewise be bitter, though the Cows cannot get at fallen Leaves. But some Farmers, who are a little curious in the Feed of Cows at this time of the Year, have the Leaves cut from the Roots, and let them lie some time together, two or three Days perhaps, before the Cows eat them, and then they observe the Milk is not bitter: But then we must take notice, that the use of the Turneps at this Time, when Grass is scarce, is to keep the Cows full of Milk; for the dry Meat or Hay alone the Herdsmen suppose will dry the Cattle: therefore the Turneps are used, as being Plants full of Juice, and are said by the Cowkeepers to fill the Cows with Milk, which might give us a farther Opportunity of Reasoning; but I shall defer it till another Time.

With these Turneps and some other Greens
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are Cows often fed in the Winter about *London* ; but these Herbs alone are too full of Juice for the Health of the Cows ; and therefore the other part of their Food is Hay, which is commonly of the coarsest sort, such as is made in Orchards, growing rank under Trees ; or such as is made of the Grass of a second Spring : But I find by Experience that the best Hay is the best for Cows ; it nourishes in the Winter, makes them strong, and keeps them in Milk, provided the Cows are turn'd in the warmer part of the Day into Grass, especially such as has had Dung spread over it about the End of *August*, before the Rains fall.

It is certain, that Cows which feed in the Spring upon high Grass abound in Milk, but that which grows rank in Orchards, is commonly sower ; for though the Cows will eat it either in Grass or Hay, yet their Milk is always poor and apt to change : Their Bodies are not strengthen'd with such Diet ; and though they continue to give Milk while they eat such Trash, yet it has been pretty well experienced by the Learned, that good Grass of the Spring, or Hay made of Grass in its Excellence, will give so much Strength to the Kine that feed upon it, that the Advantage of Milk will very well pay the Expence and make the Milk the better tasted ; for where the Diet is good the Body will be strong, and in this case will yield abundance of Milk, and especially such as is of good Use in the Dairy.

In *Somersetshire*, and some of the *Western* Parts of *England*, near the Place where the famous

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famous *Cheddar* Cheeses are made, the Lands are commonly flat and low, and are often so well water'd, that the Grass is very free and vigorous; the Cattle indeed are of a large Strain, and in this sort of Land it seems the Kine find large Subsistence: Their Parts and Vessels are naturally larger than the other sorts, and there they gather Nourishment enough from their Food to fill their Vessels and Parts in such a manner, as to make them surpass all those of the same Breed, which feed in the more hilly or dry Countries.

In *Lincolnshire*, and other Countries where this sort of Cattle is fed in Marshes, we find them grow to a very large Size; but we may remark, that these Marshes are rather used for Oxen than Cows: But however, where Cows have an Opportunity of such Food, and are of a large Kine in Nature, their Milk makes much fatter Butter than those which are fed upon short Grass; for a Proof of which we might instance *Holland*; where, according to my Observation, is found the fattest or richest Butter in *Europe*, and there the Cows feed in the Salt Marshes; where the *Parmesan* Cheeses are made, the Country is flat, and is floated Three or Four times in a Year. The most famous Place for these Cheeses is at a Town in the *Milaneze*, whose Name I do not now remember; here however we must observe, that the Water is not Salt which overflows the Land. The Isle of *Ely* and other fenny Countries always produce very good Butter; and I think it is as just an Observation, that the high dry Grounds never yield Butter, which has either
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Richness in it, or will keep three Days without changing to such a Relish as a nice Taste cannot bear. And again, in such Grounds we find, that the Cattle of whatever sort they are, do not produce so much Milk, as they would do if they were fed in low Grounds or marsh Lands. And here we ought to consider in particular, how far every distinct Kind of Grass or Herb influences the Milk, the Butter, or the Cheese; and how it happens that the Milk of a Cow of one sort shall differ from another, though they both have the same Pasture; or whether it is the Nature of these Animals at one time more than another, to give unprofitable Milk from the same Diet: Here would be a vast Field to reason upon; but at present I have not Materials sufficient to explain this Matter so fully as I would do. Before we can rightly undertake it, we must be satisfied what sort of Grass or Food the Cows have in *Suffolk*, what in *Cheshire*, and what these Creatures feed most generally upon in the other Countries of *Britain*, and also how such Grasses are water'd. I hope therefore that my Correspondents will be particular upon this Head as they meet with Opportunity of Observation; for without doubt the Goodness or Badness of Milk is govern'd by the Herbs eaten by the Cattle, as I have hinted above.

But again, if the Milk be perfectly good, it may be spoil'd by bad Management in the Dairy. In *Devonshire*, and some other Countries in the West of *England*, I observ'd that the Butter in many Places tasted of Smoak, and was apt to grow rank soon after making, which

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which made me curious to enquire into the Cause, the Milk of it self was good, and the Cream was rich; but I found that the Method of making it into Butter occasion'd both the Evils: for, first, I found that the Milk was set in brass Pans; and in the next place, the Butter was made in brass Kettles over a Fire, without a Churn: From whence we may easily conceive, that the best Milk, with this Management, could never yield good Butter; for it is certain, that Brass will communicate part of its rank Quality to any Liquor it is infused in: And where the Liquor has the same Opportunity of corresponding with Brass, as in the present Case, for twelve Hours at a time, it is no wonder if the Milk gathers from it an ungrateful Relish; but especially when it is warm'd over the Fire in brass Vessels, for then it must certainly partake of the Qualities of the Brass more than it did before in the Dairy Pans. And tho' it is generally allow'd that Vessels of Brass give less Impression to Liquors than those made of other Metals, yet we are assured Brass has some Effect upon Liquors, and especially the Juices of Animals when they are warm; for to apply the Hand when it sweats to a piece of Brass, though it be never so well polish'd, it will in less than a Minute occasion a most ungrateful Scent like that of *Aquafortis*, which will remain upon the Hand for a Quarter of an Hour. Besides which I could produce many other Instances of the like nature if it was necessary, to prove that Brass has an Effect upon Liquids, and chiefly such as proceed from Animal Bodies.

The Use of Brass Vessels however I found had been a Custom of so long a Date, that it was with great Difficulty I prevail'd upon a few to try the Method of the *London Dairies*, viz. to use glazed Earthen Pans in lieu of Brass Vessels, and to avoid the Smoaking of the Milk over the Fire, by using a Churn, which many of them had never heard of till that Time; but tho' some few have try'd this Way, and found their Account by it, yet is it so difficult to overcome the Prejudice of Education, that I do not find many who have had Resolution enough to trust their Senses, and correct the Errors of that Part of Farming, which in some Places in *England* might be render'd the richest Branch in Husbandry, and be of private as well as publick Benefit; for certainly those who excel in the Management of the Dairy have their private Gain, and may be generally useful as Examples, or in giving the World such Goods as cannot fail of a suitable Reward.

One of my Correspondents computes, that Butter, Cheese, and the Product of Milk amounts to more than an Eighth Part of the Money gain'd by Farming in *England*; and he adds, that the Money to be gain'd by this Branch might amount to much more than it does at present, if some of our Country Dairies were to follow the Examples of those who excell'd the most in the Dairy Way. I confess, that I agree with him so far as the Dairy Management is concern'd; but on the other hand, we must consider what is before related, that Soil, Grass or Herb, and the Nature of the
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Kine must first be exactly taken care of; and where these all concur, I find the *London Markets* will give in the Value of one Pound Weight of Butter four Pence or five Pence more than it would bring, if it was wanting of any of these Helps: so that Butter well made cannot fail of raising as much Money, as will gratefully reward the Care and Industry of the Farmer.

Of Cheeses we may observe many Varieties, proceeding partly from the Dairy Management, and partly from the Food of the Cattle; the Particulars, as far they relate to the Dairy, I am now collecting for the common Good, and shall account my self much oblig'd to any, who will contribute towards compleating such a Collection; and they will have this Advantage by it, that besides their own Method, they will see many others, which else would have never come to their View; and by such means, it is likely many Farms may be greatly improved.

In this Request, I desire that my Correspondents would not scruple to send me the most common Receipts for making of Cheeses, to add to those I have already provided; for tho' they may be common in one County, they may be new in another; a *Churn*, which one would believe was as universal as any Thing we could name, is still a Stranger to many Parts of *England*.

In the Accounts I desire, I should be glad of the Particulars of the Runnet, or Cheesep-Bag, the Quantity of Salt or Liquor to every Quantity of Milk, and whether the Cows Milk, is mix'd with that of Sheep, Goats,

Mares, or other Cattle; which is practis'd in some Parts of *England* and *Wales*, where I have tasted excellent Cheese, exceeding those of *Cheshire* in high Flavour and Richness; and again, to know the particular Ways of mellowing or ripening of Cheese.

I remember a *Dutch* Merchant once told me, that he had sent some of the best *Hollands* Cheeses to the *East-Indies*, and receiv'd one of them back in greater Perfection than he had ever tasted any. His Method was to lay them in Oil, and stop them close up in Earthen Vessels, which, he says, helps them extreamly, when they are about passing the Line; where the Heat is so great, that Cheeses are commonly lost by it, without such Caution as he used. One of my Acquaintance is often at the Expence of *Canary* Wine to keep his Cheeses in, which renders them very mellow, especially if they have the Help of moderate constant Warmth, about a Fortnight before they are cut. The *Angelots* might surely be made as well in *England* as elsewhere, seeing we have in some County or other, the same Food for Cattle that other Countries afford.

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An Account of Bees, the Manner how they gather their Wax and Honey, of the Structure of their Combs, their Manner of breeding and swarming; with Variety of curious Observations relating to their Oeconomy, by Mr. Maraldi; as also some Sentiments, which may be useful to such as either have or design to build Bee-houses, or study the Advantages of a well-managed Apiary.

THE Naturalists acknowledge, that Bees are the most wonderful of all Insects: The Instinct they have to feed upon Flowers, and to gather Honey and Wax from them; the Order they observe in their different Occupations, their Government, Industry, and admirable Skill in carrying on their Work; in a Word, all the Dispositions that are to be found among those Animals, have engaged the Attention both of the ancient and modern Philosophers.

Aristomachus, amongst the Ancients, spent eight and thirty Years in Contemplation of them; and *Hilliscus* retir'd into the Woods, that he might have the more Opportunity to observe them: Those two Philosophers, according to the Account given us by *Pliny*, wrote

wrote of the Nature of Bees ; and they were the Persons, perhaps, who taught others how to order them, to provide Hives for them, and reap great Advantages from them.

We are beholden to *Aristotle* for the curious and useful Observations he has left us concerning this Insect, which *Virgil* has beautify'd, and put into *Latin Verse* : These Observations were afterwards confirm'd and improv'd by *Pliny*, and several ancient Philosophers.

Among the Moderns, Prince *Frederick Cesi*, the Institutor and Principal of the *Roman Academy of Sciences*, towards the beginning of the last Century, wrote a Treatise concerning Bees, as *Fabius Columna* informs us, which he presented to Pope *Urban VIII.* and gave us Hopes it should be printed, with a Description of the Parts of this Animal, by the Help of a Microscope of *Stelluti*, a Member of the same Academy ; but we know not what is become of that Work, no more than the Anatomy of this Animal promised us several Years ago by *Swammerdam*.

We have, notwithstanding the Observations that have been made by so many learned Persons, not declined to examine this Part of Nature, wherein we have been insensibly engaged, both by the Pleasure we have had in so curious a Study, and by the Convenience of a great Number of Glass-Hives in *M. Cassini's Garden*, adjoining to the Observatory. As several of the Moderns, as well as the Ancients, have treated of the Methods how to manage these Animals in point of Profit, we shall wave that for the present,
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and content ourselves with inserting what we have found to be most curious concerning them.

We shall give you the Origin of Bees, the different Species in the same Hive, the small Number of those appointed for Propagation, and the Numerousness of those that work: We shall explain to you how these gather Honey and Wax from Flowers, and how, being engaged in different Occupations, they assist one another in their Work: We shall give you a Description of the chief Organs of Bees, and explain the Manner how they build their Cells and Honey-Combs, an ingenious and learned Piece of Architecture; most of these Observations have been verif'd several Times, and fully evidenced. As for others, you may easily judge of them by the Manner they are related; we must be content with Conjectures, as not being able to attain to a perfect Knowledge of them, by reason of the Difficulties which occur in such Inquiries: For here Nature is not only encompassed with Obscurities, as it is every where; but she has also arm'd against us, when we would look near into her, the Stings of the Bees, which renders them intractable.

Of Bees, and their different Species.

THE Number of Bees in a Hive differ according to the different Sizes of the Hives;

Hives; we reckon there are eight or ten thousand Bees in a small one, and about eighteen thousand in a large one.

We have found three different Sorts of Bees in every Hive, whether great or small: The first Sort is that we properly call *Bees*; which makes up in a Manner the whole Swarm: These are the Animals, as we shall shew by and by, that gather the Wax from the Flowers that work it, and make Honey-Combs and Cells of it; 'tis they that gather the Honey, and fill the Combs therewith in Summer Time, to maintain them in Winter; who take care to supply their Young with Food suitable to their Age, and excite a Heat which contributes to bring them to their full Growth; lastly, these are the Creatures, whose Business it is to keep the Hive clean, and to drive away whatever may be injurious to them. All these Bees have a Sting; and of this Species, there are some that are a little bigger than others.

The second Sort is what they call *Drones*; their Colour which is a little darker, and their Bigness will help you easily to distinguish them from others; for the Drones are one third longer, and a little thicker than the Bees. Some Hives have but a small Number of Drones, others have many; and there are some Seasons of the Year, when we could discern none of them: We have likewise sometimes found Drones no bigger than the common Bees; no Drone has a Sting.

Finally, We have observed a third Sort of Bees in the same Hive, that are even longer than the Drones, but not so thick in Proportion

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tion to their Length, and they have a more lively and redder Colour; we never found above three of these in a Hive, and often but one: This Bee has a grave and composed Gate, and is arm'd with a Sting; she is the Mother of all the rest, as we shall shew hereafter, but is generally Riled the King Bee.

Description of a Bee.

YOU may distinguish three principal Parts in a Bee; the Head, which by a small Fibre adheres to the rest of the Body; the Middle of the Body, which is the second Part; and that is also distinguished from the Belly, which is the third Part.

Bees have two Kinds of Saws or Jaws in the lower Part of the Head, which open and shut from the Right to the Left; its with this Organ, they gather the Wax, knead it, build and polish their Cells; they also use it to carry whatever they have into and out of their Hives.

At the same End of the Head Bees have a Trunk, whose Origin is near the Neck; it grows smaller and smaller from the Root, and ends in a Point. This Organ consists of five Branches, whereof two are separated from the rest from their Roots, on the Right and Left; the other Three are not divided from one another till towards the Middle of the

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Trunk

Trunk ; the middlemost is of a cylindrical Form, and as thick as a Hair, and being view'd with a Microscope, seems all along to be divided into several Rings, each of which is furnished with a great Number of small Hairs, which are longer towards the end of the Trunk than at the Root. This part, which we properly call the Trunk, is one of the chiefest Organs Bees are endow'd with ; for with it they gather Honey and Food from Flowers, as we shall observe by and by.

The other four Organs are longer towards their Origin, and grow smaller and smaller till they end in a Point : They are form'd like Gutters, being Concave on that Side which embraces the Trunk, and Convex on the other ; they are of a horny Substance : The two Branches, which are separated nearer the Root, are longer, and embrace the other two ; they join so well together, that they seem to be but one Pipe.

We are certain from repeated Observations, that the Bees gather their Honey with their Trunk alone, and this Organ appears to us to be a Channel into which the Honey may pass. We have likewise seen the Trunk of the Bees grow bigger or lesser by Turns, bigger at the very Instant the Bee sucks the Honey ; and as this Increase and Diminution happens successively from its Point to the very Root, this made us conclude, that the mellifick Juice causes that Swelling, as it passes into the Cavity of the Pipe : But it may also be supposed, that the Trunk from the middle is as it were the Tongue, and that the

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the Branches which encompass it assist in the Office of gathering Honey : The Tongue, after having gather'd the Honey from the Flowers, sends it thro' the Branches as far as their Roots, where it enters into the Body of the Bee, thro' which they are wont also to discharge it. These are the chief Parts of the Head, and their Uses, so far as the Smallness of them would allow us to know 'em.

The middle Part of a Bee's Body is of a sphaeroidical Form, a little extended, to which two Wings are fastned, one on the Right and the other on the Left, a little above the horizontal Line, which passes thro' the middle of the Body ; each of these Wings has another, which seems to adhere to it, and is a little smaller than the first, which lies next the Head : It is with these four Wings they make their humming Noise, as a Signal to each other.

It's also in this Part of the Body towards the lower end, that they have six Legs, viz. three on each Side ; Two of these Legs are near the Head, and are the smallest of the Six ; the other Four are fastned behind to the Side of the Belly, and very near one another ; the two Middlemost are somewhat longer than the first, and shorter than the Hindmost : All those Legs have several Joints, of which there are three that are bigger than the others ; besides these three Joints which are towards the Middle of the Leg, there are others towards its Root, and the end of each Leg ; the Joint in the Middle of both the Hind Legs is much larger than the others, and we may observe on the outer Side

a small Cavity like the Hollow of a Spoon, surrounded with a great many small Hairs: It's in this Cavity, that the Bees deposit by degrees the Particles of Wax which they gather from the Flowers as aforesaid: But we must take Notice, that the Legs or Thighs of the Drones, and of the King of the Bees, who gather no Wax, have not this Cavity.

The Ends of the Legs terminate with two Sorts of Hooks back to back, with which the Bees fasten themselves together on the Sides of the Hive, and form divers Figures, as one while a *Cone*, another time a *Plane*, and sometimes a *Festoon*; from the midst of these two Hooks a small and slender Appendix arises, which is sometimes folded and sometimes extended; it's very slender and roundish: Bees make use of this part, to fasten themselves to, and to walk upon polished Things as upon Glass: I am also of Opinion, they make use of this Part to gather the small Parts of Wax from the Flowers, and convey them from Hand to Hand to the hind Legs.

The last Part of a Bee is the Belly, and is distinguished into six Rings: We have observed two Parts in the inner Side, one of which is a Bladder, wherein the Bees deposit the Honey which they suck from the Cup or Calyx of the Flowers, after it has passed thro' the Trunk, and a very narrow Channel that traverses the Head and Breast of the Bee: This little Bladder, when it is full, is about the Bigness of a small Pea; it is so transparent, that you may see the Colour of the Honey thro' it.

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The other remarkable Part is the Sting, which is at the entring Part of the Bee's Belly, and shoots in and out very readily, by the Means of some Muscles placed very near the Sting; this Sting is about the sixth Part of an Inch in Length, and is somewhat thicker towards the Root than towards the end, which terminates in a sharp Point: It's of a horny Consistence, hollow within like a Pipe, thro' which a venomous Liquor passes, which being contain'd in a Bladder within the Belly, and a little distant from the Root of the Sting, comes out near its Point, and insinuates it self into the Wound at the same time that the Bee penetrates the Skin.

The Bee commonly leaves the Sting in the Wound, and the Sting drags the Bladder along with it, and sometimes part of the Insect's Guts: If the Sting be presently taken out of the Wound, it will swell but a little, because it does not give the Poison proceeding from the Bladder, time to insinuate it self into the Wound: But if we are not nimble in taking it out, all the Venom will soon get into the Blood, and cause a great Swelling and Pain, that sometimes lasts for several Days; but here I shall take the Liberty to insert the excellent Mr. *Derham's* Observations upon the Sting of a Bee, for the Satisfaction of my Reader.

The Sting of a Wasp or Bee is so pretty a Piece of Work, that it is worth taking Notice of; some have observ'd it to be an hollow Tube with a Bag of sharp penetrating Juices (its Poison) joyned to the end of it, with the Body of the Wasp or Bee, which

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is in stinging injected into the Flesh through the Tube. But there are besides this, two small sharp bearded Spears lying within this Tube or Sting as in a Sheath. In a Wasp's Sting, Mr. *Derham* counted eight Beards on the Side of each Spear, somewhat like the Beards of Fish-hooks: These Spears in the Sting or Sheath lie one with its Point a little before that of the other, as is represented in the Figure X, to be ready to be first darted into the Flesh; which being once fix'd by means of its foremost Beard, the other then strikes in too, and so they alternately strike in deeper and deeper, their Beards taking more and more hold in the Flesh: After which the Sheath or Sting follows to convey the Poison into the Wound; and that it may pierce the better it is drawn to a Point, with a small Slit at the bottom of the Point, for the two Spears to come out at. By means of this Mechanism of the Sting it is, that when the Sting is out of the Body and is parted from it, it is able to pierce and sting us; and by means of the Beards being lodged deep in the Flesh, it comes to pass that Bees leave their Stings behind them, when they are disturb'd before they have Time to withdraw their Spears into their Scabbard. In Fig. X we may observe the two Spears as they lie in the Sting.

Fig. Y represents the two Spears, when squeez'd out of the Sting or Scabbard, in which Fig. A C B is the Sting; c. d. and b. e. the two bearded Spears thrust out.

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*Of the Cells, and the Structure of
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ONE of the first Things Bees go upon, after a new Swarm is put into a Hive, is to form their Cells; they apply themselves with so much Diligence to this Work, that we have seen them make a Honeycomb in one Day of a Foot long and six Inches broad; and which, according to the usual Bigness of the Cells, might contain near four thousand Bees.

They begin their Work by fastning it to that which is most solid in the upper Part of the Hive, and they continue it from the Top to the Bottom, and from one Side to the other; and that they may fix it with the more Solidity, they sometimes make use of such a temper'd Wax, as is almost like Glue.

It's not easy to account for the Manner how they carry on this Work; by reason of the Number of the Bees, which are in a grand Motion, and seemingly in Confusion; however we have been able to make the following Remarks. We have seen each Bee carry a small Bit of Wax between their Chaps, and hasten to the Place of Business where the Combs were forming, and where they by the Help of their Jaws fastned the Wax, one while on the Right, and at other Times on the Left, to their Work, about which each Bee spent but a short Time, and then went their Ways; but there are so great a Number

ber of them that succeed one another in their Works, and with so much Celerity, that you will find the Honey-comb increase sensibly enough. As some of the Bees work upon the Cells, there are others that go backwards and forwards in the framing Cells, and beat the same with their hind Parts, seemingly in order to make it solid and more firm.

The Order they observe in building the Cells is this: They begin with forming the Basis, which consists of three *Rhombs* or *Lozenges*; they presently make one of these Rhombs, and trace two Planes on each Side of this Rhomb; they add a second Rhomb to the first, with something of a Declivity, as we shall observe hereafter, and trace two new Planes on each Side of this Rhomb: Finally, They add a Third to the two former, and raise two other Planes on both the Out-sides of this Rhomb, which with the other Four form the Cell; which by this Disposition of the Basis necessarily becomes an Hexagon.

While some of the Bees are imploy'd in building the Cells, others apply themselves to finish those that are newly traced, which they do with their Jaws, with which they smoothe the Angles diligently, and finish the Sides and Basis with so much delicacy, that three or four of these Sides being laid upon one another, are no thicker than an ordinary Sheet of Paper; and forasmuch as the Holes thro' which the Bees go in and out of the Cells, for which there is but just Room for them, would be too brittle and easy to be broken, by reason of that Thinness, they strengthen

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strengthen each of them with a Welt of Wax.

We have observed, that those Bees which build the Cells, generally work but a short Time together upon them ; but it is not so with those that polish them, for they continue long at it, and yet use much Expedition, without ceasing from their Labour any longer than while they carry out of the Cells those little Bits of Wax, which they have taken off in polishing ; and to the end that this Stuff may not be lost, there are other Bees ready to receive it of those that polish the Work, or come to take it out of the Cell, out of which those who are employ'd in polishing readily withdraw, and go to Work in another Place.

There are other Bees appointed to assist those that are employ'd in polishing ; for we find them often giving 'em either Honey or some other Liquor needful, either for their Work, or their own Sustenance.

Each Honeycomb has two Rows of Cells opposite to one another, with their Bases in common, and each Honeycomb is somewhat less than an Inch thick ; thus the Depth of each Cell will be somewhat more than the third Part of an Inch : We have found in several Honeycombs of a Foot long, from sixty to sixty six Rows of Cells ; each of them therefore must be a little more than the sixth Part of an Inch wide, which is about a third of its whole Length.

The Honeycombs are almost all built of this Bigness, except a small Number of others in some Parts of the Hive, which are larger ; these Cells are somewhat more than the fourth Part of an Inch wide, and about half an Inch

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long :

long : These great Cells are made to deposit the Worms in, which change to Drones, as we shall shew hereafter.

Moreover, we find in several Parts of the Hive three or four Cells bigger than the former, and made differently from them ; they are of a sphaeroidical Form, open in the nether Part, and fastned to the Ends of the Honeycombs : We do not certainly know the Use of them, but they are supposed to be the Arbours or Habitations of their Kings.

The Bases of all the Honeycombs are placed at such a Distance from one another, that when the Cells are finished, there remains no more Space between one another than is sufficient for two Bees to go a-breast : These Honeycombs are not continued from the Top to the Bottom, but are often interrupted ; and besides this, they have Openings at certain Distances, that there may be an easier and shorter Communication between them.

After having explain'd the Manner of building the Cells, we come more particularly to consider the Structure of them.

Every Basis of a Cell is form'd by three Rhombs, that are almost equal and alike, which, pursuant to the Measures we have taken, have two obtuse Angles, each of one hundred and ten Degrees, and consequently two sharp ones of seventy Degrees each.

These three Rhombs lean one towards another, and are joyned together by the Sides which contain one of the obtuse Angles ; and by their Inclination, form a mutual solid Angle, which, by reason the Rhombs are commonly

monly equal, meet in the Axis, and are answerable to the middle of the Cell; the other six Sides of the same Rhombs, besides the three obtuse Angles, form also three other Angles by a mutual Inclination, where they join together by the two sharp Angles.

These same six Sides of the three Rhombs are so many Bases on which the Bees raise their Planes, which form the six Sides of each Cell; each of these Sides is a Trapezium, which has a sharp Angle of seventy Degrees, another obtuse one of one hundred and ten Degrees, and the two Angles of the Trapeze which are on the Side of the Opening or Entrance, are right Angles: We are to remark here, that the sharp Angle of the Trapeze, is equal to the sharp Angle of the Basis; and the obtuse Angle of the same Rhomb, equal to the obtuse Angle of the Trapezium; the six Trapezes which form the six Sides of the Cell, touch one another two and two by the equal Sides, and are in such a manner joyned to the Rhombs, that the obtuse Angles of the Rhombs are contiguous to the obtuse Angles of the Trapezes, and the sharp Angles of the Trapezes to the like Angles of the Rhombs.

Now in order to know the Connection between them, and how the two opposite Rows of Cells are form'd, you must suppose several other Bases like the foregoing, that is, that they have three Rhombs with the same Angles, and that these Rhombs lean one towards another, as in the first Basis: You must then suppose, that these Bases are apply'd one to another in such a manner, that the analogous

Angles of the one are answerable to the Angles of the other; these Bases perfectly joyn together; or three Rhombs of three different Bases, by the Junction of two of these Bases with a Third, form a Basis of a new Cell like the former, with this Difference, that the Concavity of the solid Angle is turned towards the other Face of the Honeycomb, where another Row of Cells is form'd opposite to the former; and by the Junction of six Bases with a seventh, three new Bases are form'd, which have the Concavity of a solid Angle turn'd also contrary to that of the seven Bases: In like manner, by the Application of twelve new Bases to the other eight, other nine Bases are form'd, with the Concavity of the Angle turn'd opposite to the twelve; it is by this admirable Contrivance, that the two Rows of Cells are form'd in the two Faces of the Honeycomb.

There are by this Method of building three Rows of Rhombs in three different Planes, so well pursued, that several Thousands of Rhombs of the same Order are found to be all exact in the same Plane: Thus indeed it is astonishing, that several Thousands of Animals should, by Instinct of Nature only, concur to make so difficult a Work with so much Order and Regularity.

We are, in the next Place, to consider the Consequence of such a Fabrick. It has been observ'd already, that each Basis has three Rhombs, and that there is a Plane on each Side of these three Rhombs, which serves for a Side to an opposite Cell: But, besides this Use of the three Planes, they also serve for a Prop

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Prop and Support to the Basis of the opposite Cell, and supply what might be deficient, by reason of the great Delicacy of the Work. Secondly, The Concavity of the solid Angle, which is in the middle of the Basis, serves by an admirable Provision of Nature, to keep close together the Particles of Honey in a small Space, which the Bees daily supply the small Worm with for his Food, and with which he is daily encompassed after he is deposited there, as we shall shew in another Place; the Honey, which is liquid when it is gather'd, might, without such a Disposition of the Basis, run off, and so abandoning the Embrio, destroy it.

Besides these Advantages which arise from the Form of the Side of the Basis, there are also others which depend upon the Number of the Angles of the Rhombs: It is upon their Bigness, that that of the Angles of the Trapezes has its dependance, which form the six Sides of the Cell; but finding that the sharp Angles are seventy Degrees thirty two Minutes, and the obtuse ones one hundred and nine, and twenty eight Minutes; those of the Trapezes, which are contiguous to them, ought also to be of the same Bigness: Moreover, the solid Angle of the Basis is by this Bigness of the Angle of the Rhombs equal to each of the three solid Angles form'd by the obtuse Angle of the Rhomb, with the two obtuse ones of the Trapezes; from this Bigness of the Angles, there results not only a greater Facility and Simplicity in the Structure, but a more beautiful Symetry from the Disposition and Form of the Cell.

Finally,

Finally, The Bees make their Cells of a regular Hexagon, by a kind of Skill in Geometry, as *Pappus* a famous Geometrician of the second Century has observed: There is that Property in this Figure, that if you place several of them near one another, they fill up a Space round the same Point, without leaving any Vacuity between one Figure and another. There are two other Figures that have the same Advantage, and those are the Equilateral Triangle and the Square; however they have not the same Capaciousness as the Hexagon.

It is therefore with Wisdom, that the Bees, according to the Opinion of the said Mathematician, prefer the Hexagon before other Figures, as it contains a greater Quantity of Honey in it, than the Triangle or Square would do.

Of the Generation of Bees.

THE Bee, which they call the King or Queen, is the Parent of all the rest; she is so fruitful, that as far as we are able to judge, she produces eight or ten Thousand young ones in one Year, for she is usually alone in the Hive one Part of the Year; and the Hive towards the end of the Summer is as full of Bees, as in the beginning of the Spring: In the mean time, one Swarm goes out every Year, and sometimes two or three, each of them consisting of ten or twelve thousand Bees;

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Bees; the King must therefore necessarily produce Part of these different Swarms; I say Part, because every King that goes out with a new Swarm, may produce a Part of them before they swarm.

The King, for the most part, remains concealed in the inner Part of the Hive, and is not to be seen but when he deposits his Young in the Comb, which are exposed to Sight.

It is upon these singular Occasions, that we have been able to discern him, tho' he is not always to be seen; for we find, for then the most part, at that Time, a great Number of Bees fastned to one another, and form a kind of a Veil from the Top to the Bottom of the Hive; so that they interrupt our Sight, and do not remove thence till the King has laid the Young.

When he appears in Publick, he is always attended with ten or a dozen Bees of a larger Size than ordinary, who are as it were his Retinue, and follow him wherever he goes, with a composed and very grave Gate. before he lays his Young, he puts his Head for a Moment into the Cell, where he designs to deposit them; if the Cell be found to be empty, and has in it neither Honey, Wax, nor any Embrio, the Bee immediately turns about, and thrusts the hinder Part of its Body so far as to touch even the Bottom of the Cell: The Bees which attend her, at the same time, stand round about her with their Heads turn'd towards her, caress her with their Trunks and Legs, and make her a kind of a Feast, which lasts but for a very little while; after which she comes out of the Cell;

Cell; and we may then perceive a small white and very slender Egg, about the four and twentieth Part of an Inch or a little more in Length, and four or five Times as long as it is thick, a little more sharp-pointed at one End than at the other, with the thickest End set upon the Basis in the solid Angle of the Cell. This Egg is form'd by a thin, white and smooth Membrane, which is full of a whitish Liquor.

The great Bee immediately after she has laid an Egg in one Cell, passes with all the same Circumstances, and with the same Number of Attendance, to lay another in a neighbouring Cell; and we have observed her, in this manner, to lay eight or ten in different Cells immediately after one another, and it may easily produce a greater Number; she retires after she has done laying, accompany'd with the same Bees into the inner Part of the Hive, and we see no more of her.

The Egg, which lies in the Bottom of the Cell, continues for four Days in the same Condition, without any Alteration as to Form or Situation: But upon the Expiration of that Time, we find it changed into a Maggot, whose Body is jointed in several Rings, and is folded up in such a manner, that the two Ends touch one another. It's then incompass'd with a little Liquor, which the Bees at the four Days end place at the solid Angle of the Basis. What the Nature of this Liquor is cannot be known, by reason of the Smallness of its Quantity; and so we remain in doubt whether the same be Honey carry'd

carry'd thither by the Bees for the Nutri-
ment of the Embrio, or some other Matter
proper to fructify the Sperm ; for it appears
to us to be more whitish, and not so liquid
and transparent as Honey.

But of what Nature so ever this first Li-
quor may be, wherewith the small Worm is
incompassed, it's certain that the Bees after-
wards carry Honey for its Nourishment,
and they bring them a greater Quantity of
Food in Proportion to their Growth, till the
eighth Day, when they augment it so much,
that it takes up the whole Breadth of the
Cell, and great part of its Length: After
which, the Bees take no further Care of these
young ones, but stop up all the Cells which
contain those Worms. After the stopping of
the Cells the Worms remain twelve Days
longer, during which the Embrios undergo
divers Changes ; which we have discover'd
by opening those Cells on different Days,
from the Time they were stop'd up. First,
the Worms change their Situation, and in-
stead of the Foldings that were before on the
Basis of the Cell, they extend themselves in
Length, and place their Heads towards the
Mouth of the Cell ; the Worm's Head is a
little unfolded, and we may then begin to
see some small Lengthnings, which, in my
Opinion, are the first Beginnings of the
Trunk ; a black Point may also be seen upon
the Front of the Head, and at a little distance
from it a black Streak upon the Back, which
does not reach to the Extremity of the
Worm : You may, in like manner, discern

the first Lineaments of the Legs, but very small.

When the Head is form'd, and the Trunk extended, all the other Parts come afterwards to appear ; infomuch that the Worm becomes wing'd, and grows by degrees a perfect Bee, except only that she is white and soft, and has not that kind of cruſted Skin with which ſhe is afterwards cover'd.

The Worm, by this Transformation, diſveſts herſelf of a white and very fine Skin, which ſticks ſo exactly to the inner Sides of the Cell, that it aſſumes the ſame Figure of Angles, as well at the Baſis as on the Sides, and ſeems to be but the ſame Body.

The Bee being diſveſted of this Pellicle, has ſix Legs ranged upon her Body, from towards the Head to the hind Part of the Body, where the hindmoſt are. The Trunk, with its quaternal Covering, is ſituated in its full Length in the miſt of the ſix Legs, from the Head almoſt to the extream Parts of the Body : The Wings lie along the two hind Legs on the Side of the Belly ; they are not then at their full Extent, but in ſeveral Folds.

The Bee being in this Condition, there are ſeveral Parts of her Body that change Colour one after another. The Eyes at firſt are of a dark yellow, but they afterwards become of a violet Colour, and at laſt black. The three Points which form a Triangle with equal Shanks on the Top of the Head, are afterwards found to be of the ſame dark yellow, and then changing as the Eyes do, at laſt become black. The Ends of the
Wings

Wings are ting'd with a dark Colour. The Horns are equally divided into two by Joints, and undergo a Change, first that which is farthest from the Head, and then the nighest to it. The Trunk and the Legs appear at the same time of a Chestnut Colour. The whole Head, as well as the Breast, from a bright Earth Colour, become gradually darker. The Wings explain themselves, and extend to their natural Length. We also begin to observe the Hair, which covers the Bees, and is form'd and disposed upon the Head, Breast, and the rest of the Body, in a very agreeable manner.

The Bee, after having undergone all these Changes, becoming a perfect Insect, from the twentieth Day of her Age, endeavours to get out of her Cell; she makes then a round Hole with her Jaws in the Cover that stop'd it. When the Bee is advanced thus far as to quit the Cell, it seems drowsy, but quickly assumes her natural Agility; for she may the same Day be seen coming out of the Hive, and returning from the Fields laden with Wax like the rest: You may distinguish these young ones by their Colour, which is a little darker than the old ones, and by their Hairs which are more whitish.

After the young Bee has made her Passage out of the Cell, two other Bees go thither presently; one of which takes away the Cover, and it chips and uses the Wax, which it was made of elsewhere; the other is imploy'd in refitting the Opening: For the young one having left it round or unequal, when she made her Way out, this same Bee puts it into its first

hexagonal Form, strengthens it with the usual Border, and clears it of the little Pellicles left by the young Bee, which perhaps are the Offcastings of the Shanks; for as to that new Pellicle which encloses her whole Body before she leaves the Cell, we are of Opinion, it sticks like the other before mentioned to the inner Sides of the Cell: These Pellicles so sticking to the Cells make them change Colour; and hence it is that we find Honeycombs in one Hive of a different Colour: Those wherein there has been nothing but Honey being of a bright Yellow, and those out of which the young Bees come of a dark Yellow; we have sometimes pull'd off from a Cell, which has been the Cradle of several Bees, no less than eight of these Pellicles one within another. When the Cell is brought to its former State, the Bees sometimes the same Day lay new Eggs therein; they now and then put in Honey first. We have seen Bees lay their Young in the same Cells at five different Times, within the Compass of three Months.

How Bees gather Wax.

BEES gather two sorts of Wax, that are different from one another; the first, which is brown and glewy, serves to stop up all the Holes in the Hive, and sometimes to stick the Honeycombs to the Hive; the other sort is the ordinary Wax they make use of in building the Cells.

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Bees gather common Wax from the Leaves of a great many Trees and Plants, and from all Flowers that have Chives or Apices; they gather a great Quantity from the Flowers of Rocket, and especially from those of the common Poppy, which have Plenty of these Chives; they often have their full Load before they get out of one of these Flowers; but they are so prodigiously nimble at their Work, that how attentive soever you may be in observing them, it's with much Difficulty your Eyes can follow them; and that you are able to find out the Way they take the Dust from the Flowers: It is indeed certain, that they sometimes gather the Wax with the Hairs which cover their Bodies, which they roll upon the Flowers; for they may be seen returning out of the Fields, with their Hairs full of small Particles of Wax like Dust; but this comes to pass only when the Mornings are moist; the Humidity which is then upon the Flowers, being perhaps the Cause why these Particles cannot so easily be put together, in that Part of their Bodies where they are wont to deposit them; but when they are got into the Hive, the Warmth therein causing the Moisture to evaporate, they can the more easily gather the Wax with their Feet, by stroking their Hairs several Times with them.

They often gather the Wax with their Chaps and two fore Legs; from these they convey them to the middlemost, and thence afterwards to the Joint in the middle of the two hinder Legs, where at last it is found gather'd together to about the Bigness, and
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in the Shape of small Lentils. This Joint is larger than the others, and has a small Cavity like that of a Spoon: Again, this Concavity is encompassed with small Hairs, which serve to keep the Wax in its Place, to the end it may not fall off, when the Bees return to the Hive.

Besides these usual Parts which Nature has furnished them with, they likewise use a wise Precaution, that they may not lose the Fruit of their Labour: As the Bees convey the Particles of Wax to the hind Legs, they squeeze them together; and this they do by the Help of the two middle Legs, which they turn backwards, and apply them several Times, and in different Ways, upon the Wax; in the same Manner, as we are wont with both Hands to squeeze such Particles as we have a Mind to press together. These are chiefly their Occupations and Cares; when being laden with a sufficient Quantity of Wax, they are ready to take the Wing, and return to the Hive; and if the Flowers, upon which they alight, are agitated by the Wind, they seek out a more quiet Place, and such as is more proper to shelter them from the stormy Motion of the Air.

When the Bees are got into the Hive, they disburden themselves of the common Wax two different Ways; for resting upon their two fore Legs, they make several Motions with their Wings and Bodies, sometimes to the Right, and at other times to the Left; and as if this Motion and Noise were made on Purpose, to give Notice to their Companions, three or four of them come, and take

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take each a small Quantity of the Wax with their Jaws : After which come several others, who take their Share of the Lading till no more remains, and then they return into the Fields for a new Harvest.

This is also the Way they disburden themselves of the other sort of Wax, or rather Glue, which sticks so fast to the Bee's Thighs, that both those that come to take it off, and the others that are laden with it, are obliged to use their utmost Efforts on both Sides to get it off.

But when the Hive has a great many Cells, they use a more ready and expeditious Way, and such as stands in need of no Help to get rid of the common Wax. The laden Bee finds out a Cell, where is neither Honey nor any Worm ; and then with her two fore Feet fastning her self to the upper Edge of the Cell, she afterwards folds her Body a little forward, in order to put her two hind Legs into the Cell. In this Posture she turns the two middle Legs backwards ; and so slipping them from the Top to the Bottom along the two hind Legs, where the two Lentils, like Bodies of the Wax, are lodged, she loosens them by this Means, and leaves them in the Cell.

There are some that content themselves with letting the Wax thus drop into the Cell, without taking the Pains to put it into order ; but most of them go into the Cell, and very dexterously dispose the two little Bodies of Wax above mentioned, so that they may lie by the Side of one another in the Bottom of the Cell, and then withdraw.

Another

Another Bee presently succeeds the former, out of those that attend, from the Arrival of the laden Bee at the Cell, where it discharges the Wax, and these Attendants by Turns carry on the Work : If the two Bits of Wax are not placed as aforesaid, they carry 'em into the Bottom of the Hive, and temper them with their two Jaws for half a Quarter of an Hour ; insomuch, that when the Bee withdraws, those two small Bodies of Wax are reduced into the Consistence of a Paste ; which gives us Cause to think, that the Bees in tempering the Wax, mix some Liquor therewith, either Honey or some simple Moisture, proceeding from the Place from which they are wont to discharge the Honey, and with which the Bladder was perhaps filled.

Several other Bees come in the same Manner, to unload in the same Cell ; and as one goes, another comes on, to temper the Wax, till the Hive is almost full of this sort of Wax, placed sometimes in Lays of divers Colours, as whitish, yellow, red and brown, according to the Flowers or Leaves from which the Wax has been gather'd by different Bees.

We find in several Parts of the Hive a great Number of Cells full of this Wax, and they are as it were the Magazines to which they have Recourse upon Occasion ; for as it is their Business for a great Part of the Year on certain Days to cover the Cells, wherein their Young are enclosed, and to stop up those that are full of Honey, it's necessary they should have a Store by 'em for that Purpose.

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The Wax which is found in the Cells, is not yet so perfect as that of which the Honeycombs are form'd; for tho' the first be temper'd with some Moisture, yet, if you press it between your Fingers, you may reduce it to Dust, whereas the other Wax is a kind of thickned Paste; the Bees therefore, before they use it in the building of their Honeycombs, must fit it for that Purpose; and that which likewise induces us to believe it is, that the Wax in the Cells, which is at first of different Colours, is always white immediately after the Honeycombs are built.

Of the Gathering of Honey.

BEES gather Honey from those Flowers, whose Calices are no deeper than the Length of their Trunks: But each Flower contains so little Honey, that they touch upon a great many, before they get together a sufficient Quantity to fill the small Bladder that is the Receptacle for it, as we said in the Beginning of this Discourse. As soon as the Bees alight upon a Flower, they extend their Trunk, and convey it to the Bottom of the Cup or Calyx, where they suck the Honey; but when they find the Bladder is full, they return to the Hive, and carry the Honey into a Cell, where they discharge it by that Part of the Head situate between the two Jaws, which they extend more than

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usual, and keep but a little open: They deposit the Honey by moving their Heads sometimes on one Side, and sometimes on the other; and when they find a Drop happens to be ill placed, they extend the Trunk to take it up, and then order it in the same manner as the rest, by discharging it as before from that Part of the Head that is between the Jaws. As the Honey, which one Bee carries at a Time, is but a small Portion of that which the Cell can contain, the Honey gather'd by a great many Bees must go to fill it.

When the Cells are full of Honey, they stop up those they reserve for their Winter Store, with a very thin Wax Cover; but those Cells which contain Honey for their daily Food are open, and at the Disposal of the whole Swarm. That Honey which is to be used last for their Sustenance, is always put into the most inaccessible Place, that is, in the upper Part of the Hive, if it has no Lid that can be taken up; but if it has one, they leave empty Honeycombs in the upper Part, and deposit the Honey in the middle of the Hive.

Of several other Particulars concerning Bees.

BESIDES what we have already observ'd concerning Bees, Nature has endow'd them with other Talents, which we judge to be worth remarking. They love Property, and there is nothing they will not undertake to preserve

preserve it. They use the Glue which they gather, to masticate the Glasses round the Hive, and even the Hive it self round the Foot-stall, so that they can by this Means hinder the least Insects to get in.

There are Bees that watch the Mouth or Entrance of the Hive, to oppose those Insects that would get in that Way; and when one Bee is not strong enough, several others come in to her Assistance.

It would be too tedious to recount all the Remarkables we have observ'd upon this Occasion; let it suffice that a Snail, which forced her Way into the Hive, notwithstanding the Efforts of several Bees, after they had killed her with their Stings, was found cover'd all over with this Mastick or Glue, as if they design'd thereby, either to hinder the Stink her Flesh might make in the Hive, or to hinder the Production of Worms from the Putrefaction.

Nature has furnished Bees with a most exquisite Smell, for they will scent the Honey and Wax at a great Distance.

They have divers Ways that would make a Man apt to believe that they have Understanding; they are also subject to fight and kill one another, not only in a single Combat, but in a Body; which yet does not usually happen, unless it be in the Autumn, when the Stock of Honey is not enough to support the whole Swarm during the Winter.

They seem to have some Knowledge of good and bad Weather: For they not only keep within when there is any likelihood of bad Weather; but when any Storm happens

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when they are abroad, they avoid it by quitting their Work, and returning to the Hive almost all together, and with much Precipitation; they do the same when they are surpriz'd in the Fields by some Rain, tho' but little.

Nothing agrees better than Heat with Bees; the more intense it is, the more they are animated to, and the more active at their Work; Cold, on the contrary, is very injurious to them: and let them be never so vigorous when they are in the Hive, if they go out of it in Winter-time, they are so seiz'd therewith, that they appear to be almost immediately motionless; but if you do not delay to bring 'em near a Fire, the Heat it yields will restore them to their former Vigour.

To fortify themselves against Cold in the Winter Season, they place themselves in the Middle of the Hive, as near one another as they can, in that Space which lies between two Honeycombs; there they agitate their Bodies from time to time without changing Place, and this Motion excites a Heat, which secures them from external Cold, and is often so considerable, that it is communicated to the Glasses of the Hive. It's likely, that they succeed one another in this Work, for there is a continued Motion Night and Day in the Hive; and there are some of them which take their Rest in the Day-time: And this Rest even conduces to the Benefit of the Publick; for their Presence in the Hive helps the Heat, by the Means of which the young ones inclosed in the Cells are hatched: Which we have found true by the following Experiment. We

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We have sometimes taken off a Piece of a Honeycomb, in whose Cells there were young Worms, and left it in the Bottom of the Hive, and found a great Number of Bees sitting upon these Combs, where they continued till the young ones came out perfect Bees, after which they wholly forsook the Combs ; this also shews the Care which the common Bees take of the Young.

We have taken Notice of the several Ways and Motions by which they understand one another : For Example, when a Bee is at work upon the Combs, and requires Honey of another which brings it from abroad, she that wants the Honey extends her Trunk, and takes it from between the other's Jaws ; and as the one discharges the Honey thro' that Part, the other receives it with her Trunk without spilling a Drop ; they likewise understand one another, when by the Motion of their Wings they require to be disburden'd of the Wax, which they have gather'd in the Fields, and also in the Morning they excite one another to go out to Work. Lastly, When several Bees have a mind to quit a Place, if one makes a Motion with her Wings that causes a small Sound, all the rest, according to her Example, make the same Motion, and retire : I believe this is the Way they give Notice to one another in the Hive, when they make ready to go forth and swarm.

Of the Drones.

THE Drones are usually one Third thicker and longer than the Bees ; they have a rounder Head, and are more thickly cover'd with Hair : It's certain, they have no Sting, and that their inward Parts differ from those of common Bees.

They are seldom seen out of the Hives ; and when they do go forth, it is about two or three in the Afternoon, and never but in fair Weather. They do not return laden with Wax, but we have found their Bladder full of Honey like the other Bees, which they have either gather'd in the Fields, or taken from the Hive before they set out, which last is most likely ; for we could never see them alight upon the Flowers, neither after their Return to the Hive could we observe them deposit any Honey in the Cells. We are also of Opinion, that they are not furnished with Organs proper to discharge it, as the Bees are ; for in Bees, if you squeeze that Part of the Body, where the Honey-Bladder lies, never so little, it will presently come out at that Part of the Head thro' which they are wont to discharge it into the Cell : But it is not so with the Drones ; tho' after you have open'd them, you will find their Bladder full of Honey.

There are Hives wherein you have but few Drones, but there are a great many in others ; they continue for Part of the Summer dispersed in the Hive : After which as their Number increases, they draw together
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in Troops, in several Parts of the Hive, where they continue cantoned almost without making any Motion.

When the Swarm goes out, and all the Bees are in Motion, the Drones keep their Station, and go not forth with the Swarm; or if they do, they are but a very few. But, from the End of *July* to the Middle of *August*, these Drones are attack'd by the common Bees; and tho' the Drones are bold and resist as long as they are able, yet they are at last forced to yield and go out of the Hive, and we know not what becomes of them.

When this kind of Fight happens, you may see all these Animals in great Motion, as well without as within the Hive, much in the same manner as when they swarm: All these Drones are so universally expell'd, that of several Hundreds which we have often found in one Hive, we could not by the End of *October*, discern one in the several Hives we searched upon that Account.

We have in the Spring and Summer-time seen a great Number of small Worms in the Cells, tho' we could not find any Drones in the same Hive, notwithstanding all the Care we took to examine them.

They have the same Origin with that of Bees, and they proceed from the King, and are produced with the same Circumstances, except only that the Drones are bred in such large Cells of the Honeycombs as are made on Purpose for them.

It has been already observ'd; that a Hive has some Combs, whose Cells are one third or one half larger and longer than the common Cells. The King makes choice of these great Cells, in order to lay therein, with all the Circumstances we have already noted concerning the common Bees; those Eggs which afterwards become Drones, and which you cannot by your Eye distinguish from the common Eggs: But it is likely that the Parent who produces them knows them, because he assigns them Habitations in Proportion to that Bigness they are to attain to in their full Growths. These Drones are subject to the same Changes we have related concerning Bees; they are as many Days before they come out of the Cells; they are stop'd up the eighth Day after their Eggs are deposited in the Cells; but their Covers are much more raised, the more to lengthen the Cells, and to make them as long as the Drones.

Finally, They are fed with the same Care as the common Bees; but it is amazing, that that Attention and that Love which the Bees shew for these young ones, should be turn'd into so great a Hatred at the Expiration of the Summer: This Hatred is so universal, that they do not spare even the young Drones that are yet imperfect in the Cells; for we have seen several times, that when one Party of the Bees are driving the great Drones out of the Hive, there is another employ'd to open the Cells, where the imperfect Drones are lodged, in order to pull them out from thence to kill them and convey 'em out of the

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the Hive, there is another employ'd to open the Cells, where their imperfect Drones are lodg'd, in order to pull them out from thence, to kill them and convey 'em out of the Hive, where we have sometimes seen two or three Hundred kill'd of young and old.

*A Description of the inward Parts of
the Drones.*

THE Conformity there is between the inward Parts of the common Bees, more particularly as to the Head, Breast, and the Beginning or fore Part of the Belly, and those same Parts in the Drones, is such, that we have not been able to discern any Difference between them; for the Trunk and Breast, both of the one and the other, are much the same as to Bigness; and they have all of them a Bladder in the Belly, of a very delicate Contexture, which is the Receptacle of the Honey; also the Intestines seem to be of the same Structure, except only the Parts situated at the Extremity of the Belly, which are very different from those of the Bees. We have observ'd before, that common Bees have in that Place a little Bladder full of a clear and transparent Liquor like Water, which is the Poison they discharge by the Sting, thro' which it passes, and comes out near the Point of it: But the Drones have neither Sting nor Bladder; they have in this Part of the Belly, some other Parts that seem worthy to be taken notice of, and which perhaps will lead us to understand the End for which Nature has design'd them.

The Belly of the Drone towards its hinder Parts is divided into two unequal Parts, by a kind of a whitish and very thin Diaphragm; that towards the Head is smaller, and the other towards the hinder Part larger, wherein those of the Intestines are contain'd; which, on one Side, have a Communication with the Honey Bladder; and which, after having form'd several Foldings immediately under the Back, and round the Parts we are about to describe, terminate at the *Anus*.

We may observe four glandulous cylindrical Bodies under the Intestines, which are round at one End, each of them separately invested with a Membrane; they are rang'd two and two upon one another; the two lowermost are commonly the biggest; and are disunited, except at one End, where they join together in a Point, and both of them form one common and very narrow Channel: These two Bodies are about the third Part of an Inch long; the other two Bodies are shorter and smaller, they are also cylindrical, and are join'd by a kind of Pellicle to the larger ones near the hind Parts, where the great ones join together.

Tho' these two Bodies are commonly smaller than the two former, yet we have also found them in different Drones to be often almost equal; and in this Condition, you will find all four of the same Colour, which is bright and somewhat inclining to yellow; when the two lowermost are thicker than others, they then contain a liquid, glewy and whitish Matter, which appears thro' the thin Coat which encloses it; but the uppermost always retain the Colour we have mention'd before. If

If you press those two Vessels when full of this Matter, you will force it thro' the common Channel before mentioned, along which it passes to the hind Part, and so out of the Body of the Drone; but when these Bodies are not equally fill'd with this Matter, you cannot press out any Liquor at all.

This Channel in the Drones Body is folded into several Plaits, but does not take up above a Quarter of an Inch space; tho' when it is unfolded, and at its full Length, it's about an Inch or somewhat more, and has all along different Conformations and Capacities: It's a very narrow cylindrical Channel at the Rise of it, about half an Inch long or a little more, of a very fine Texture, and easily broken; after which it grows considerably bigger to the Extent of a Quarter of an Inch; the first half of which retains the same fine and delicate Texture, but the other Part of this Channel is of a more remarkable Structure.

There are two Bodies that are almost Triangular, equal, of a horny Consistence, thin, crooked, and of a dark red Colour, which form part of this Channel; these we call Wings, because they somewhat resemble them: The two Sides of each of these Wings along the Channel are somewhat different, and terminate in a very sharp Angle; the third Side following the Breadth of the same Channel, makes but about one third of the others; the two Wings lie almost back to back throughout the Length of the biggest of the Sides, and are not separated here any otherwise than by a small Space taken up by the Continua-

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tion of the common Channel which joins them together: These Wings are so well united to the Channel, that it may be said it is the Channel it self that is stiff; there is only one Part of the sharpest Angle that is separated and embraces the Channel. Besides these two Wings which are of a horny Consistence, there are two others which are smaller by half, of the same Colour and Substance as the former, situate on the Side of each of the preceding ones; they arise in that Part of the Channel, which answers the Middle of the two first Wings, and terminate with them, almost in the same Place: Those four Wings take up but a Part of the Compass of the Channel, the other being the Channel it self continued; but here it seems to be strengthened by some muscular Fibres, which have their Origin in the same Place where the Channel grows wider, and terminate at the Ends of the Wings, which are indented, and to which these Fibres seem to be fastned.

The Channel is of the same Consistence as before, at the Extremity of these Wings, except that it is narrower and flatter; for it would appear larger, according to the horizontal and vertical Diameter: This Part of the Channel, which is no more than the twelfth Part of an Inch about, terminates in a Bag, at the End of which there is a Figure resembling a double Cock's Comb; that is, it is a little hollow in the Middle, indented round, and admirably regular; the greatest Points being towards the End of the Bag, from whence they come diminishing on both Sides even to their Origin. There is a
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Communication between this Bag and the Channel; for in squeezing the Channel, the Matter contain'd therein, enters into this Bag, passes thro' the Cock's Comb, fills all its Eminences, and at length goes out near the Hole of the Bag thro' which it went in; here seem'd to me to be a double Channel, one for the Matter to pass in; and the other to go out at.

The Continuation of the Canal immediately next the Bag, is of a stronger Consistence, and almost muscular; this Part of the Canal is not above the eighth Part of an Inch in length, and it has all along on the Outside four Rings placed at equal Distances from each other; these Parts of Rings surround but one half of the Channel, and they are muscular, redish, raised on the Outside, and thicker towards the Middle than the Ends.

On the opposite Side of the Channel, where these Parts of the Rings terminate, there is another Body of a horny Consistence and redish Colour, which takes up but a small Part of the Circumference of the Channel; it is a kind of an Ellipsoid, raised up towards the Middle, and flat towards the Edges, and extends more in the Length than the Breadth of the Channel.

To help this Body on the same Side of the Channel where the Parts of the Rings are, there is also another redish muscular Body, five or six times broader, and longer than the former: From these Bodies to the Right and Left arise two strait long Muscles, which are apply'd to the Channel long Ways, and whose Ends unite with the Parts of the Rings above mentioned. These

These same Bodies do not embrace the Channel throughout; but where they cease, there are two other Muscular flat Bodies of a redish Colour, that run along the Channel, and come out like two Ligaments, which are fastned to the lower Part of the Belly, on the inner Sides of the Crust, which covers the Drone: Finally, the End of this Channel terminates in the Crust of the Drone, and ends in an Orifice, through which the Matter contain'd in the two Cylindrical Bodies is thrust out, after it has passed through all the Parts of the Channel we have been describing.

It often happens, when you hold Drones between two Fingers, without pressing them at all, that they will burst with a Noise; and that this Channel, with all its Parts, will come out at the *Anus*, which presently occasions their Death.

Though it is difficult for us to know exactly the Use of those Parts, we may however say with some probability, that they appear to have been formed for Propagation; and as we are confident that the King, who may be easily distinguished from the Drones by his Size and Colour, is a Female, we may say, that the Drones are Males.

Upon this supposition of the four Cylindrical Bodies, of which we have spoke before, the Two small ones inserted in the Two Biggest, may serve for Testicles, and the two biggest for Seminal Vessels, where the Liquor contained therein, and which is the seminal Substance, is brought to Perfection; this Matter coming out of the two
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little Bladders that are between the long and the straight Channel, passes from thence into the large Channel, to which the four Wings are fastned.

It is easy to conceive, that when the two glandulous Bodies are filled with this Matter, that it glides and passes through the narrow Channel, and from thence into a bigger; but that it may afterwards enter from this great Channel into a narrower, it's necessary that the Liquor should be compress'd; the four Wings on the inner Sides of the large Channel coming near one another by the Means of the Fibres, which are joined to their Ends, may press this Matter on the great Channel, and cause it to pass into all the Parts of the Bag and Folds we have mention'd, which subtilizes and makes it more perfect; those Parts of the four muscular Rings, which below the Bag encompass'd some of the external Parts of the Channel, and whose Ends are fastned to the Longitudinal Muscles, may compress the Channel, and squeeze the Matter out of it. The two Muscles which come after, may serve instead of a Sphincter, and close up the Channel; the other two long Muscles, which are fix'd to the inner Sides of the Drone, may perhaps be the former's Antagonist, and serve to open the same Channel that the Matter may pass, which teems or impregnates the Female's Eggs.

We have not hitherto been able to discover in what manner this Impregnation is brought about, whether it be in the Body of the Female, or after the way of Fishes, when the

the Female has spawn'd: The whitish Matter that encompasses the Egg in the Bottom of the Cell soon after it is laid, seems to carry it in favour of this last Opinion, as well as the Remark which has often been made concerning a great number of Eggs which have produced nothing in the Bottom of the Cell, and about which no such Substance has been observed.

From some Observations made at different Times, it has been conjectured that Drones contribute nothing at all to the Generation of Bees; for, upon the Examination of several Hives, not only in the Autumn, after the Drones have been driven away by the Bees, but also in Summer time, when we have found in the Hives a great many Eggs and young Bees enclosed in the Cells, we met with no Drones. But by a late Observation we have made, there's room to believe, that there might be some Drones in those Hives, though we have not been able to distinguish them from amongst so many Thousand Bees: But upon a more nice Enquiry, we have lately observ'd a great many Drones that are much smaller than those taken Notice of before, and which exceed not the Bigness of small Bees, inso-much that it would be no easy thing to distinguish them in the Hive from common Bees, without dissecting them, or very close Examination: It might very well be, that though we could find no large Drones in the Hive, that yet there might be some of these small ones intermix'd, and pass undistinguished amongst the rest of the Bees, since we
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knew not before, that there were any of that Size.

All the Cells of the Hive, wherein these small Drones are found, were little, and there were no large Cells to be discover'd.

After these Observations upon Bees and their Oeconomy, it may be expected I should say something concerning their Hives, and the Way of managing them; both which I shall, in due Time, be very particular in, as well as endeavour to shew the Profits that may arise from them; but I have but just room in this Month's Paper, to mention some few Heads which I shall enlarge upon in the succeeding Sheets; as that, first, in regard to their Hives, they should be so contriv'd, that they may open into one another, which will give the Bees room to add to their Store when a plentiful Season of Flowers happens to be attended with proper Weather for their going Abroad; and likewise, that when we have a mind to take any of their Honey, we may avoid killing the Bees: The Hives I mean, are in some respects like the Box-hives, which are commonly made Hexangular.

2dly, I shall have Occasion to treat of the Bee-house, wherein these Hives are to stand, of its Contrivance for Warmth in the Winter, and to prevent the Inconvenience of the Bees stinging or annoying the Person who takes the Honey; and in which place likewise we may see them at work, without disturbing them.

3dly, I shall give a List of those Plants and Flowers which they chiefly gather their Wax

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and Honey from, and the Seasons when such Plants blossom, that one may guess, by looking into their Hives, whether they may get sufficient Store for Winter, which we ought to enquire into very narrowly, lest we weaken our Stock. To this *Memorandum*, I shall add what Things may be proper to feed them with, in case of bad Weather in their working Season, that we may help them sometimes; for if we find a Stock which begins to make fresh Combs at the End of Summer, we may be assured they are weak, and will not live the Winter through without timely Help; even though they can go Abroad they must be assisted: and upon this Topick I have engaged a Correspondence with some of the most curious Men in *England*.

*An Explanation of the Figures in the
Cut for September.*

Fig. 1. **T**HE King, or rather Queen of the Bees, according her natural Size.

2. The Drone the same.

3. The Bee the same.

4. The Basis of the Cell in its Horizontal Situation, that you may have the better Idea of the Form of the Egg as soon as it is laid, and in what Manner it is usually placed upon the Basis.

5. The Basis of the Cell in its vertical and natural Situation, with the Egg changed into a Worm or Caterpillar, and encompassed with a little Liquor Four Days after it is hatched.

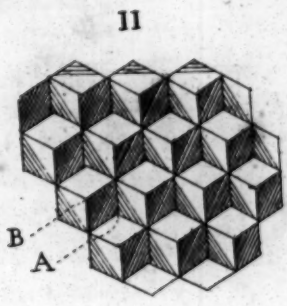
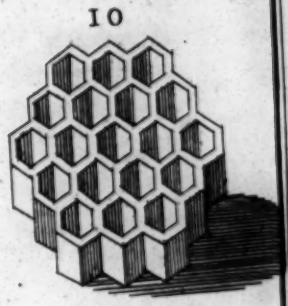
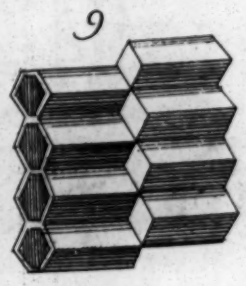
6. The Worm, according to its Growth, Eight Days after it has been hatch'd.

7. The same Worm Ten Days old, after it has alter'd its Shape and Situation.

8. The same Worm chang'd into a young Bee that is bigger than ordinary, that is yet white and soft.

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9. Part of the Honeycomb, which represents how the Cells are ranged in the Two opposite Sides of the Comb.

10. A piece of a Honeycomb representing the Cells on the Inside.

11. Several Cells, whose Sides are taken away, that you may only see the Bases: This Figure gives us to understand how these Bases are ranged in respect to one another, and in what manner the two Orders of Cells are form'd in the two Faces of the Honeycomb: For the Angle A represents the solid Concave Angle which is at the Bottom of the Cell, in one Face of the Comb. The Angle B and the rest of the same Order, shew the solid Angle, which is Convex in the same Face of the Comb, but Concave in the opposite one, and found at the bottom of the Cell opposite to the former.

X, The Sting of a Bee, according to Mr. Derham, F. R. S. in the Sheath.

Y, The Sting of the Bee from the said curious Observer, out of the Sheath.

Remarks upon the Weather, and Produce of this Month.

THE two last Days of the preceding Month the Wind was Easterly, with some Showers, which continued till about the Fifth Day; and then the Wind shifted to the North West, and continued about that Quarter, with fair Weather, till the Ninth; when it came about to the South West, and was follow'd with Rain; about the West and South West Point, it continued till the Sixteenth Day, and was accompanied with Rain and brisk Gales of Wind; the Wind then shifted to North East, where it held till the Seventeenth, when it came about to the West, where it held for a Day or Two, and then was unconstant, shifting to East, and sometimes

times touching upon the North Quarter, the Weather continuing fair till the Twenty Seventh, and for the most part calm; and from thence to the End of the Month, the Wind changing by the North towards the Western Quarter, we had Showers and cool Air.

We have great Variety of Fruit this Month, that is to say, a Continuance of all those sorts mention'd in the preceeding Month, with an additional Store of Autumn Pears, and some of the best sort of Grapes, which in *August* were not forwarded enough to ripen, through the Badness of the Summer; such as the Chianti Grape, Red Muscadine, blew Raisin, and black Muscadine; and at Mr. *Fairchild's*, two new sorts of extraordinary Bigness, both in Bunch and Fruit, one of them call'd the *St. Peter*, the other the *Hambrough*. The Pine Apples at Sir *Matthew Deckers's* still continued ripening; and such Cucumbers as had the Advantage of running against Walls, were very fair and fit for the Table, but those upon the Ground good for little. Some blanch'd Sellery and Endive begins to come in, and some Asparagus were cut on the natural Ground, where the Haulm had been cut down in *July*. About the End, I saw some very good Morello Cherries against a North Aspect, and I question not but they will remain good till the next Month.

My Correspondents will, I hope, still continue to oblige me with their useful Letters, directed for me at the Publishers of this Treatise.

The End of the Month of September,

